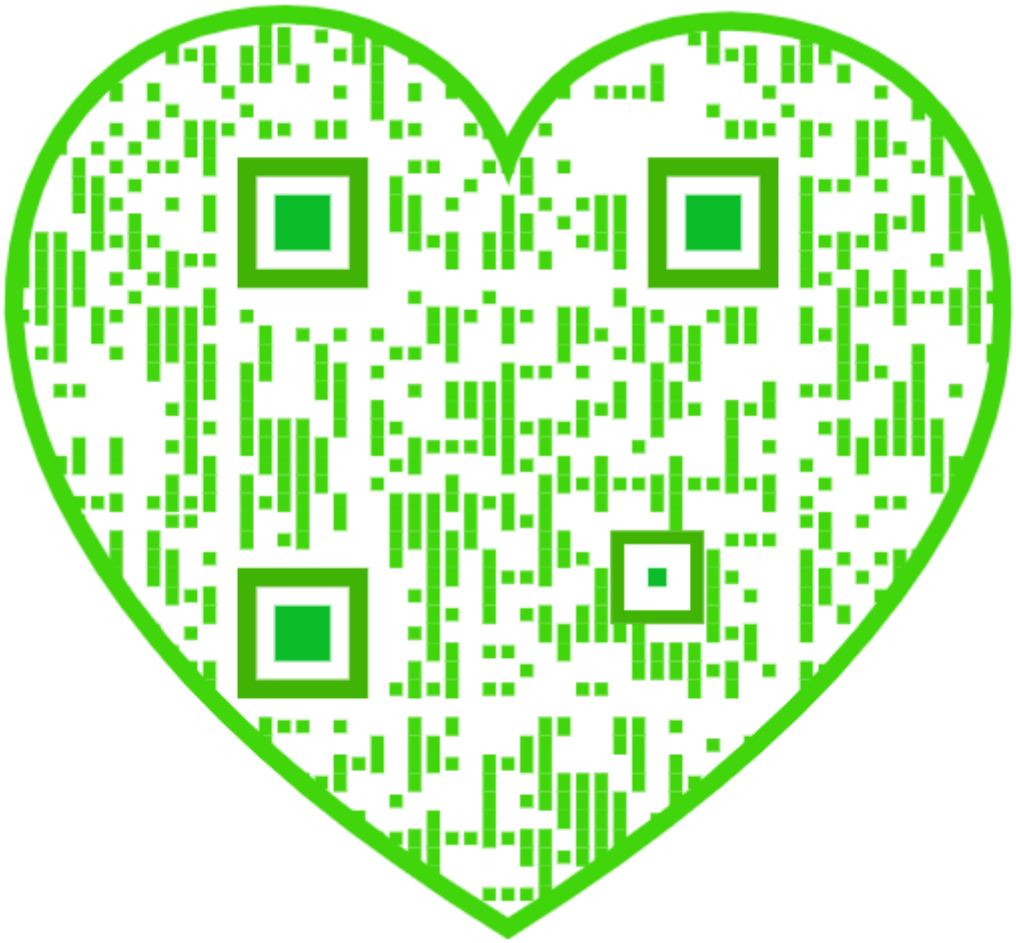

THE AMERICANA

SCHOOL OF ATHENS

The fresco of "Philosophy" in the Camera della Segnatura, Vatican Palace, Rome. Height to arched top 16 feet; width 26 feet 8 inches

This splendid fresco was painted by Raphael in 1511 to represent the "Triumph of Science," as a companion painting to the Dispute of the Sacrament, representing the "Triumph of Religion." Philosophy, implying an encyclopedic knowledge of the whole sphere of scientific learning and intellectual culture, is here symbolized. A vast portico is pictured, the arches of which are pierced with statue-filled niches; the facing statues are Apollo and Minerva. The central figures are Plato and Aristotle. Grouped about them are all the philosophers, sages, and elders of antiquity discussing the problem of life. Diogenes is prone on the steps; Aristippus passes him talking to Protagoras; to the left, on the steps, Alcibiades, Xenophon and others are listening to Socrates. Below them are Pythagoras, with his wife Theano, his son Telauges, and his pupil Archytas; Anaxagoras is standing; Heraclitus sits alone; Democritus and Epicurus at the base of the pillar. To the right, on the steps are Pyrrho, Arcesilaus and others; below them Archimedes (a portrait of Bramante) teaches geometry, and Ptolemy and Zoroaster stand beside Raphael, Il Sodoma, and Perugino. Vasari says the fresco represents the union of Theology and Philosophy through Astronomy, and points out Saint Matthew as Pythagoras. It has also been said to represent Saint Paul preaching at Athens, and in 1560 Giorgio Mantovano engraved it as Saint Paul disputing with the Stoics and Epicureans.

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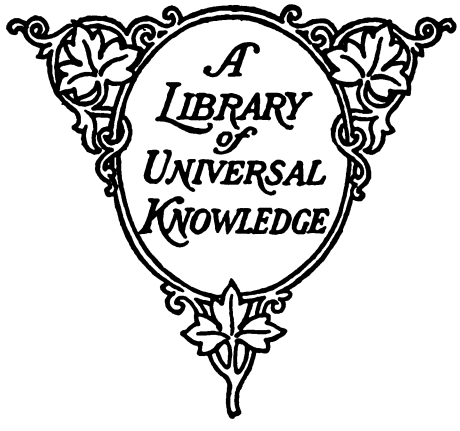

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ANIMAL PSYCHOLOGY

KEY TO PRONUNCIATION.

ã	far, father
ā	fate, hate
a or ă	at, fat
ā	air, care
ạ	ado, sofa
â	all, fall
ch	choose, church
ē	eel, we
e or ĕ	bed, end
ė	her, over: also Fr. *e*, as in *de; eu*, as in *neuf;* and *oeu*, as in *boeuf, coeur;* Ger. *ö* (or *oe*), as in *ökonomie.*
ę	befall, elope
ē	agent, trident
ff	off, trough
g	gas, get
gw	anguish, guava
h	hat, hot
h or H	Ger. *ch*, as in *nicht, wacht*
hw	what
ī	file, ice
i or ĭ	him, it
i	between e and i, mostly in Oriental final syllables, as, Ferid-ud-din
j	gem, genius
kw	quaint, quite
ṅ	Fr. nasal *m* or *n*, as in *embonpoint, Jean, temps*
ñ	Span. *ñ*, as in *cañon* (căn'yŏn), *piñon* (pēn'yŏn)
ng	mingle, singing
nk	bank, ink
ō	no, open
o or ŏ	not, on
ô	corn, nor
ȯ	atom, symbol
o͝o	book, look
oi	oil, soil; also Ger. *eu*, as in *beutel*
ö or oo	fool, rule
ou or ow	allow, bowsprit
s	satisfy, sauce
sh	show, sure
th	thick, thin
t͟h	father, thither
ū	mute, use
u or ŭ	but, us
ú	pull, put
ü	between u and e, as in Fr. *sur*, Ger. *Müller*
v	of, very
y	(consonantal) yes, young
z	pleasant, rose
zh	azure, pleasure
′(prime), ″(secondary)	accents, to indicate syllabic stress

PREFACE TO THE NEW EDITION

TO impartial critics and scholars, no less than to the thousands of its possessors among the general public, the first edition of THE AMERICANA commended itself as a useful work of reference. In many ways, both in its emphasis and in its treatments, it was a departure from the beaten track of earlier works, and experience has shown the wisdom of this departure. The characterization of the work in *The Encyclopedia of Education:* " Notable for its fullness in articles dealing with technical subjects, as mathematics, engineering, and the trades," is true, even if it fails to state the whole truth. In History, Political Economy, Religion, Philosophy, Astronomy, Education, Literature, as well as in topics of general interest, the first edition was not surpassed by any contemporary American work.

In view of the tremendous changes that the great world conflict has brought about in every department of human thought and activity, and the vital necessity for a new and up-to-date restatement of the world's knowledge, the publishers determined to issue this new edition, and ordered the work planned upon a scale to make it of still greater utility, retaining whatever features the experience of the past had shown to be excellent, and enlarging and improving wherever necessary to meet present conditions. New departments and thousands of new articles have therefore been added, and the whole work has been revised and reset and is printed from new plates. The maps have been prepared especially for this Encyclopedia by the Rand McNally Company of Chicago, and are late and accurate. The illustrations have been carefully selected and are far superior and more numerous than in the former edition. We are confident therefore that the new AMERICANA will be recognized as the greatest repository of practical universal knowledge in one set of books that has ever appeared in the English language.

In the new edition, the Editor has endeavored to limit the work to its legitimate purpose — the presentation of knowledge with faithfulness and

with scholarly impartiality, avoiding the promotion of theories and such discussions and defenses as are entirely foreign to the character and nature of an encyclopedia. Every effort has been made to secure not only accuracy of statement but also fairness and correctness of view.

The " Americana idea " is not simply a reference " book of facts "— too brief to be of any special value to the intelligent reader; nor yet a series of " learned and splendid essays," showing an utter misconception of the idea which justifies the existence of a general work of reference. It is rather an endeavor to present, in an intelligent and informing way, the history and nature of the civilization, institutions, systems, activities and achievements of mankind with sufficient fullness to furnish the general reader a fair and adequate understanding of the development of man and his social life. In dealing with " the dead past and the living present " this Encyclopedia does not seek to dogmatize beyond the established facts. It is content to tell what is known so far as we know it, and leave it there. It knows no north or south — no national boundaries; it has no political, governmental, religious, or social proclivities or antipathies; it is neither pro nor anti; it is neither a maker nor an ultimate interpreter of history; it does not preach sermons, or inculcate morals, or prophesy future events; it neither eulogizes good men nor abuses the bad; but seeks to maintain in all things the spirit of fairness, and aims to avoid pedantry and intellectual cocksuredness.

The prime object has been to give a clear, concrete, definite, truthful and up-to-date statement of every subject, without prejudice or bias of any kind; to present in the most intelligent, authoritative, impersonal and impartial manner the actual facts of knowledge so far as it is humanly possible to do so. True, analysis must be made; opinion must be offered; judgment must be passed; perhaps criticism and even condemnation may occasionally be necessary, but it must all be done in the spirit of true scholarship and high service.

The thousands of contributors are representative of the highest scholarship and authority in the United States and other countries, and the editorial staff is composed of men and women of wide knowledge and experience, possessing special encyclopedia training.

The Editor-in-Chief and his staff of co-workers are solely responsible for the literary development of this work. Appreciative acknowledgment, however, is due and is here made, to all the friends of this enterprise who have

encouraged its production, and especially to those who by their practical advice and scholarly assistance, as well as by their personal contributions, have rendered invaluable service, among whom may be mentioned:

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To give an adequate statement of the civilization of the world to date, even thirty volumes have proved few enough, but it is the hope and belief of the Editor that the new edition of THE AMERICANA will prove an efficient aid to the educational and intellectual forces of America, and of especial value at this time to the general public of the whole English-speaking race.

George Edwin Rines

A

The first letter of every alphabet except the old German or Runic and the Ethiopian: the "futhark" of the former places it fourth, the latter makes it thirteenth. As all alphabets ultimately come through the Phœnician (witness the name itself), this arrangement is natural. Our own is inherited from the Latin, which was derived from the Greek; and the latter in its *alpha* confirms its traditional derivation from the Phœnician where and in Hebrew it is called *aleph*, Aramaic *alph*. The name is said to have meant "ox," and so strongly resembles the root-element of elephant that there is little doubt the original meaning of both was the same. Hence formerly the shape of the lower-case *a* was derived by some from the rough outline of an ox-head with its horns; but in fact, as evidenced by a comparison of the gradual evolution of forms, the small letters in all cases are derived from the capitals, and the Greek capital A (see table under ALPHABET) in its original shape was a somewhat more cursive form of the Phœnician *aleph* which itself was a conventionalized form of the Egyptian *hieratic*, and that in turn (the final step backward) was conventionalized from the picture of an ibis in the ancient Egyptian hieroglyphics or ideographs.

The sound of the letter has varied little more than the form — perhaps less — except in modern English, which owing to its composite character has made it a symbol of so many different vowel-sounds as to be well-nigh meaningless. Yet even here most of them have never quite lost connection with the earlier vocal efforts it stood for, and their fluctuations are fixed by the character of the vocal opening. The Phœnician sound represented by the letter *aleph* cannot have corresponded to the Greek *alpha* or any of its derivatives, as the former alphabet assumed that all syllables began with consonants, and *aleph* was in some sort consonantal; but the Greeks made it a pure vowel, the so-called "Continental" or broad *a* as in "ah." This is the simplest and most fundamental of all vowel-sounds, the earliest uttered by infants,— whence many grotesque theories of its divine origin and the reasons for its position,— since it results from opening the throat and mouth wide and emitting the tone from the larynx, with the least friction or interference possible from the other organs; and it is still the most general on the Continent of Europe. But even there it has been largely flattened by the French into the short sound as in "at"; at the end of words in all languages the dropping of the voice tends to slur it toward the sound of *u* in "but," which in English it quite attains; and with us it has become the representative of nine distinct sounds, seven of them each recognizably developed from one of the others, and all from the parent sound, while two are of a different order yet still explicable. The usual arrangement ("fate, fat, far, fall," etc.) is entirely misleading, as it obliterates this evolution which the following makes clear:

(1) *a*h, explained above.

(2) *a*ll, a closer sound than (1), formed by drawing back the tongue, compressing the sides of the throat, and speaking more toward the diaphragm. In general utterance this is perhaps the first change from *ah*. It is almost universal among the Hindu and Persian masses ("ghaut" for ghät, etc.), and was very common in England and America in the 18th century: witness pronunciations like "spaw" for "spa"; the curious aberrant "vawz" for "vahz" which has more curiously become accepted as a sort of social touchstone in a small group; family names like R*a*leigh, Dec*a*tur T*a*ney, etc., in American pronunciation.

(3) w*a*s, wh*a*t. The same pronounced still deeper in the diaphragm, and cut short instead of prolonged.

(4) ov*a*l. This is the "*neutral*" sound, corresponding to "short u"; used in Western languages only in unaccented syllables, and made by lazily opening the organs as little as possible and putting no stress on the expiration of the breath. It is the closest of the vowel-sounds, and the most diaphragmal, and therefore seemingly the antithesis of "*broad a*"; it has in truth no special relation to that more than to *e* and *o* ("sil*e*nt," "apr*o*n"), but is the common weakened form of all. In Hindu speech it is used stressed, as in the familiar "Juggernaut" (Jaganath), "Buckergunge" (Bakarganj), etc.

(5) b*a*re. A more open sound than (1), formed in precisely the same manner as (2) except by expanding instead of contracting the throat.

(6) *a*t. Identical with (5) except being cut short instead of prolonged; in fact, its short sound.

(7) *a*sk. Always a different sound from

the others, but not always the same in itself. With the less cultivated speakers it is nearly identical with (5), even with (6). With others, anxious to avoid the flatness and exaggerating in the opposite direction, it is made identical with (1). With the majority of good speakers it is akin to (1), but shorter and more diaphragmal, and with the organs rather closer together.

(8) *a*ny, m*a*ny. This is not one of the group of *a*-sounds, but is "short e." The change was caused by assimilation of the *a*-sound to the *i*-sound of the closing letter.

(9) *a*te. This, in usual order the first given, considered the typical English *a*-sound, and actually furnishing the pronunciation of that letter in its alphabetic position, is not merely not an *a*-sound at all, but not even a simple vowel-sound being nearly ĕĭ, sliding quickly from a closer and more diaphragmal "short e" to a vanishing sound of "short i." As in (8), the cause appears to have been originally assimilation with a final vowel (the sonant *e* now so often silent but "lengthening" the *a* before it), and afterwards extended to words where this principle could not act.

A, in general, the first term of any series.

In music, the first note of the scale of A, major minor; and A minor is the relative (or related) minor of (or belonging to) C major; the Continental *la*. The open second string of the violin sounds it, and the instruments of an orchestra are all tuned to it. As a fixed tone a′ (435 vibrations) is the standard by which all instruments are tuned. In theoretical works A denotes the triad of A major and a the triad of A minor. In the score of works requiring more than one performer the letters of the alphabet are used as guides, to help find the places readily in case of repetition.

In logic, the universal affirmative ("all trade is barter"), distinguished from the particular affirmative ("some trade is barter"). See LOGIC.

In algebra, the first letters of the alphabet, *a, b, c,* etc., are used to denote known quantities, while the last, down to *z,* denote the unknown,— *a* and *x* being used first in all cases, the others being added according to need.

In geometry and mechanical diagrams, the capitals A, B, C, etc., are used to mark off points, lines, angles, and figures; in complicated diagrams, often supplemented by the small letters and accented, to indicate the closer relations of parts.

As an abbreviation, see ABBREVIATIONS.

As an adjective or attributive, shaped like the letter A; as an A tent.

Consult Petrie, W. M. F., 'The Formation of the Alphabet' (1912); Rippmann, 'Sounds of Spoken English' (London 1910); Stucken, 'Das Alphabet und die Mundstationen' (1913); Sweet, 'History of English Sounds' (Oxford 1908); Taylor, I., 'The Alphabet' (London 1883).

A is also the first of the Dominical Letters.

A, word. (1) The form of "an" used before consonants. (2) Broken-down form of "on," or ellipsis of "for a" ("twice a day"). (3) Old form of "ah," as a war-cry ("A Douglas!").

A1, ā-one′ (colloquially, "first-class"), the mark for highest-grade wooden vessels in Lloyd's (q.v.) 'Register of Shipping.' **A** refers to hull, 1 to rigging and equipment. This rank is assigned by Lloyd's, surveyors to new ships for a term of years prefixed to the symbol, as 10A1) dependent on quality of materials and mode of building; but to retain it they must be periodically resurveyed, and if fit are granted continuation for one to eight years, marked 10A1 Cont. 5A1, etc. **A** in red means over-age, but still fit for any voyages which perishable goods can endure; **Æ** in black, fit for short trips with similar goods. In all cases the 1 is omitted if rigging, etc., are inferior. Iron and steel vessels have a Gothic **A** preceded by numerals from 100 down, 100**A** to 90**A** resurveyed once in four years, 85**A** and below once in three; rigging, etc., marked same as on wooden ships. In the German Lloyd's **A1** and **A** are the two best grades of wooden ships; **B1, B, CL,** and **CK,** lower ones; iron and steel ships are marked as in the English classification, but with the resurvey term marked under the **A.**

Aa, ä ("water": a general Indo-European word in various shapes,— Ger. *ach* or *aach* in Aachen, Biberach, etc.; Lat. *aqua,* pl. *aquæ,* whence O.F. Aigues, Mod.F. Aix, in compounds; etc.), the name of some forty streams in northern and central Europe: among the chief, a French river rising in dept. Pas-de-Calais, flowing into dept. Nord, and reaching the Strait of Dover at Gravelines; about 50 miles long, navigable below St. Omer, and connected with Calais and Dunkirk by canals.

Aa, *geologically,* a Hawaiian term much in use to describe lava flows with rough, cindery surfaces.

AACHEN, ä′Hen. See AIX-LA-CHAPELLE.

AAGESEN, Andrew, ä′gĕ-sĕn, Danish statesman and jurist: b. 1826; d. 1879. In early life he commanded a reserve battalion in the Schleswig war of 1848. He was appointed professor of jurisprudence in his alma mater, the University of Copenhagen in 1855, where he was distinguished by his learning and attractive personality. He was an expert in Roman law, in maritime and commercial legislation, and was the chief author of the navigation law of 1882. He was elected to the Landsthing in 1879.

AAHMES or **AHMES,** ä′mess, (c. 1700 B.C.) the author of the hieratic papyrus in the Rhind collection, deciphered by Eisenlohr in 1877, which is the first extant mathematical document from Egypt, or indeed from anywhere. It contains crude approximations to the area of an isosceles triangle or trapezoid, and the fairly correct value $(\frac{16}{9})^2$ for π. It also contains the first trace of the notion of equation.

AAHMES I, the founder of the 18th dynasty in Egypt, c. 1600 B.C., and its final liberator from the Hyksos or Shepherd Kings, Asiatic nomads who had conquered the land a century or two before. Native kings had already recovered it in part; but Aahmes captured the last Hyksos fortress, Hatwaret (Awaris), expelled them from Egypt, and followed them into southern Palestine, besieged their army five years in "Sharuhen" and captured it. He then penetrated farther into Palestine, levying tribute on it and on the seaboard. This began a long series of Egyp-

tian retaliatory expeditions into West Asia and a long dominance over it. He had an admiral of the same name, whose self-laudatory inscription on his tomb is a most valuable mine of knowledge on the military and naval operations of the time. AAHMES-NEFERTARI was his queen: her mummy-case, one of the most magnificent ever discovered, is in the museum at Gizeh.

AAHMES II, the **Amasis** of Herodotus, fifth Pharaoh of the 26th dynasty, c. 570–526 B.C. An officer of Aipries headed a revolt against him, and overthrew and killed him. Though he seems to have risen from the ranks, and to have loved roystering and disliked royal etiquette, he made a capable and judicious sovereign; saved Egypt from conquest by Nebuchadnezzar (who ravaged it, but retreated), and managed to preserve it from invasion by Cyrus the Great. He was on very friendly terms with the Greeks: lending his influence to promote their commerce and colonization; assigning them the excellent port of Naucratis, which soon grew into a flourishing city; contributing liberally toward the rebuilding of the burned temple at Delphi; and according to Greek story having cordial relations with several philosophers and princes — Pythagoras, Polycrates, etc. Under the reign of Aahmes Egypt enjoyed much prosperity.

AALBORG, âl'bork ("eel-town"), Denmark, the chief city of N. Jutland; on the south side of the Limfjord (a sea-arm which joins the Cattegat to the North Sea), and on the Danish State Ry., which crosses the fjord by an iron bridge 990 feet long, one of the finest pieces of engineering in the kingdom. An important commercial town as far back as the 11th century (Wallenstein sacked it in 1627, the Swedes in 1644 and 1657). Despite a shallow harbor it has much trade, by means of small vessels, with Scandinavia and England; and it manufactures liquors, leather, lumber, soap, cement, cotton goods, etc. A bishop's seat, it has a cathedral; also two old churches, an old castle, a museum, and a well equipped library. Pop. 33,500.

AALESUND. See ALESUND.

AALEN, ä'len, Germany, town of Württemberg on the Kocher river, 46 miles by rail east of Stuttgart. It is situated in the foothills of the Swabian Alps, 1,400 feet above sea-level. It was the boyhood home of Christian Schubart the poet who is commemorated by a statue. Large iron works, woolen, linen, ribbon and leather manufactures are carried on. Aalen was a free imperial city from 1360 until its annexation to Württemberg in 1802. Pop. 11,400.

AALI PASHA, Mehemed Emin, ä-lē' pä-shä', mĕ-hĕm-ed' ä-min', a Turkish statesman: b. Constantinople 1815; d. 6 Sept. 1871. Entering public life at 15, he was chargé d'affaires at London 1838, ambassador to Great Britain 1841–44; chancellor of the divan 1845; thrice minister of foreign affairs in the troublous years 1846–52; grand vizier a short time in 1852 but soon displaced as not in political accord with his companions. Recalled as foreign minister during the Crimean war of 1854, in March 1855 he took part in the treaty of the "four guarantees"; in July again became grand vizier, and at the Treaty of Paris in 1856 showed great decision and cleverness in looking after Turkish interests, but without entire success. In November his political tone forced him to resign, but he remained minister without portfolio, and member of the Great Council. After Reshid Pasha's death in 1858 he was again grand vizier, and soon again withdrawn; but in November 1861 he resumed the office of foreign minister. He was president of the convention on Rumanian affairs, Paris 1864, and member of the Black Sea Conference in London 1871. During the Sultan's absence at the Paris Exposition in 1867 he was regent; and while the very soul of the reform movement energetically suppressed the Cretan rebellion and the movement for Egyptian independence. In the full tide of activity he suddenly died,— an excellent man and statesman who strove all his life, like Midhat Pasha, but with little success, to regenerate and modernize his country.

AAR or **AARE**, ar ("river"), the name of several German streams: chiefly, a Swiss river tributary to the Rhine, about 175 miles long, the largest in Switzerland save that and the Rhone. Formed by torrents from the vast and famous Oberaar and Unteraar glaciers of the Bernese Alps in E. Bern, it flows northwest through the valley of Hasli over the Handeck Falls, 200 feet high, expands into Lake Brienz, and past Interlaken into Lake Thun, becomes navigable, passes Bern, turns north and then northeast along the southern slopes of the Jura, past Solothurn and Aarau, and joining the Limmat, shortly after breaks through the ridge and empties into the Rhine at Waldshut. Chief affluents, the Saane, Zihl, and Emme, the Reuss feeding it from the lake of Lucerne and Zuger See, the Limmat from the lake of Zurich and the Lütschine from the two splendid Grindelwald glaciers. The chief cities on its banks are Bern, Solothurn, Aarau and Interlaken.

AARAU, ("Aar-meadow"), Switzerland, capital of the canton of Aargau; right bank of the Aar, 41 miles northeast of Bern, 1,100 feet above sea-level, in a fertile plain just south of the Jura, whose peaks close by are the Wasserfluh (2,850 feet) and Giselahfluh (2,540 feet). It has famous manufactures of cannon, bells, and fine scientific instruments, besides cutlery, leather, silk, and cotton; and holds eight fairs yearly. There are also historic, scientific, and ethnographic museums, a cantonal library rich in volumes of Swiss history, and a bronze statue of the historian and novelist Heinrich Zschokke (q.v.), who lived here. Here, December 1797, the old Swiss confederacy held its last session; April to September 1798 it was the capital of the Helvetic Republic. Pop. 9,800.

AARDVARK, ärd'värk (Dutch, "earth-pig"), the Cape ant-eater (*Orycteropus capensis*). Also called ground-hog and ant-bear. A South African mammal measuring about five feet from end of tubular snout to tip of long naked tail. It lives in shallow burrows and is of timid, nocturnal habit; it feeds on ants and other insects, licking them up with a long tongue which secretes a sticky saliva. The head is slightly pig-like, with erect ears; the

stout body is sparsely covered with short stiff hairs; the limbs are short, with strong claws for digging; the flesh is edible and considered delicate, though of peculiar flavor. See ANT-EATER.

AARDWOLF (Dutch, "earth-wolf"), a timid, nocturnal South African carnivore (*Proteles lalandii*), the only representative of the family *Protelidæ*. It resembles the hyena, to which it is closely related, but has less strength of jaw and teeth. Its fur is coarse; color ashy-gray irregularly striped with black; muzzle, black and nearly naked; ears, brown outside, gray within. It inhabits burrows, and being unable to kill vertebrates lives upon insects, larvæ, and small carrion.

AARESTRUP, Emil, â'rĕ-stroop, Danish poet (1800–56). He was born in Copenhagen. He was not duly appreciated until after his death, but is now acknowledged one of the foremost lyric poets of Denmark, ranking next to Christian Winther. His 'Collected Poems,' with critical sketch by G. Brandes, was published at Copenhagen in 1877.

AARGAU, ar'gŏw ("Aar-shire": Fr. Argovie, ar-gō-vē), Switzerland, an extreme N. canton between Basel W., Zurich E., Lucerne S., and the Rhine and Baden N. Area 542 square miles; capital, Aarau. It consists mainly of spurs of the Alps and Jura, nowhere over 3,000 feet above sea-level, with numerous fertile valleys watered by the Aar and its S.E. tributaries, the Limmat (or Linth) and Reuss (see AAR) being chief. The climate is moist and variable, and stock-farming and agriculture are advanced: fruit, vegetables, and vines abound, but the wines are inferior. Timber is plentiful. Manufactures: cottons, silks, ribbons, linens, hosiery, straw-plait, etc., and important machine works. The boat traffic on the Aar and Rhine, and the active land and water transit trade, employ many. It has several picturesque ruined castles. Aargau, part of old Helvetia, then conquered by the Franks (5th century), a Hapsburg fief 1173–1415, then captured by the Cantonal League and divided between Bern and Lucerne, was split up and a part made a member of the Helvetic Republic 1798. Its constitution was first fixed by the Congress of Vienna in 1815; in 1831 it gained a democratic one, and has ever since been a champion of liberalism. In 1841 it suppressed its eight monasteries, and this led to the formation of the Sonderbund (q.v.), or Secession League, of Catholic cantons in 1847. Legislative power is vested in the Great Council, one for every 1,100 people, which has to submit laws and decrees to a referendum; executive power in the Small Council of five, chosen by and from the Great one. Aargau sends 10 members to the National Council. Pop. (1913) 236,860, nearly all German. See SWITZERLAND and consult Hierli, J., 'Die archäologische Karte des Kantons Aargau' (Aaran 1899); Zschokke, E., 'Geschichte des Aargaus' (ib., 1903), and 'Historische Gesellschaft des Kantons Aargau' (ib., 1898).

AARHUUS, âr'-hoos, Denmark. (1) District, the east central part of Jutland, divided into Aarhuus and Randers *amfs* (or bailiwicks); area, 1,821 square miles; pop. about 325,000, mainly employed in fishing industries. (2) City, the second largest of Denmark, capital of Aarhuus amt, on a bay of the Cattegat and the Danish State Ry.; has a harbor made in 1883–90, with a breakwater and six feet of water, regular steamer lines to Copenhagen and England, and a large trade in grain, cattle, etc.; and much shipbuilding, iron-founding, cotton-spinning, and other manufactures. It is a bishop's seat since 948, making it one of the oldest cities in Denmark; its cathedral, begun in 1201, is one of the largest and finest church buildings in the kingdom. It has a museum, banks and a stock exchange. Pop. about 62,000.

AARON, ar'un, a prominent but subordinate figure of the Exodus period in Jewish history, whose importance increases with the distance of the recorder from the early epochs, and with the remodeling of the early histories by the priesthood to support their later pretensions and their theocratic ideal of Judaism. In the earliest or Elohistic (q.v.) portions of the Hexateuch, he is brother of Miriam (Ex. xv, 20); but it is Joshua who is Moses' minister for religious rites and who keeps guard over the tent of meeting (Ex. xxiii, 11), the young men of Israel offer sacrifice, and Moses alone is the high-priest. Aaron, however, seems to be regarded as ancestor of one set of priests, those at the Hill of Phinehas, and perhaps of those at Bethel. In a later portion it is he who yields to the demand for an idol, and fashions the golden calf—an evident genealogy of Baal-worship, accredited to the ancestor of rival priests. In the Yahvistic portions he is Moses' older brother, but is brought upon the stage only to be ignored: Pharaoh sends for him and Moses to take away the plagues (Ex. vii), but he has no independent power and is merely Moses' agent in performing miracles, bringing on plagues, etc. The supererogatory nature of his functions makes it probable that his rôle is introduced by the priestly redactor, under whose hands he becomes a mighty leader little inferior to Moses: he sometimes receives laws directly from Yahwé (Num. xviii); he with Moses numbers the people; the Israelites rebel against him as well as Moses, though, when he criticises Moses, curiously his inciter Miriam is punished, not himself (Num. xii); he and Moses jointly disobey Yahwé's command at Meribah; and he is punished by having his life close before entering Canaan. This magnifying connects itself clearly with the post-exile books, where he is the ancestor of all legitimate priests, consecrated high-priest by Moses, and alone permitted to enter the Holy of Holies yearly: he represents the tribe of Levi, and even within it his descendants alone are rightful priests, and interlopers (see KORAH) are stricken dead by Yawhé. The pre-exilic prophets know nothing of this claim: Ezekiel traces the origin of the Jerusalem priesthood only to Zadok (q.v.). He belongs to the tribe of Joseph and its struggle to secure admission to the Jerusalem priesthood. Consult Meyer, Ed., 'Die Israeliten und ihre Nachbarstamme' (1906); Schmidt, N., 'Jerameel and the Negeb' (in the *Hibbert Journal* 1908); Oort 'Die Aaronieden' (in *Theologisch Tijdschrift* 1884).

AARON BEN ASHER, Jewish scholar: lived in Tiberias early in the 10th century. He

completed one of the two existing recensions of the vowels and accents of the Hebrew Bible. His rival Ben Naftali also completed a similar work, but the readings of the former are usually preferred.

AARON BEN ELIJAH, renowned Karaite theologian: b. Cairo, Egypt, 1300; d. Constantinople 1369. To distinguish him from his father, Aaron ben Joseph, also a famous scholar, he was often called "Aaron the Younger." By many he is considered the most logical reasoner of the Karaite school and in the profundity of his learning the equal of Maimonides. In accordance with the doctrines of the Mutazilites, which influenced him early in his career, he emphasized the reason as the medium for salvation and enunciated a materialistic theory of the universe, though of divine origin. His first work was 'Ez ha-Hayyim' ('The Tree of Life', 1346), which was followed by 'Gan Eden' ('The Garden of Eden', a Karaite code, 1354); 'Keter Torah' ('The Crown of the Law', a commentary on the Pentateuch, 1362). Most of his life he lived in Nicomedia, in Asia Minor, but later in life took up his residence in Constantinople.

AARON, Hill of, a lofty mountain range of Arabia Petræa, in the district of Sherah or Seir, 15 miles southwest of Shobeck. On its highest pinnacle — called by the Arabs Nebi Haroun — is a small building supposed by the natives to inclose the tomb of Aaron; and it may be the Mount Hor of Num. xxxiii.

AARSENS, Frans Van, är'sens, Dutch diplomat: b. The Hague, 1572; d. 1641. From 26 on he represented the States-General at the court of France for many years, first as agent and then as ambassador; and Richelieu ranked him one of the three greatest politicians of his time. He also held embassies to Venice, Germany, and England. The judicial murder of John of Barneveld by Maurice of Orange in 1619 was greatly helped on by Aarsens, who has gained a tardy popular opprobrium for it through Motley's life of John.

AASEN, Ivar Andreas, â'sen, ē'var än'drāas, Norwegian philologist and poet: b. Orsten, 1 Aug. 1813; d. 1896. At first a botanist, he turned philologist and student of native dialects from motives of patriotic enthusiasm: his great aim was to construct from their older elements a new national language ("Landsmaal"), as a substitute for Danish, in pursuance of which end he published several valuable philological works and set going the nationalistic movement called "maalstrœv." As a poet he produced 'Symra,' a collection of lyrics, and 'Ervingen,' a drama.

AASVAR, âs'-vär, Norwegian islands near the Arctic Circle, where the great Nordland herring are caught in December and January to the extent of sometimes 200,000 tons, and 10,000 men are employed, who live elsewhere the rest of the year.

AASVOGEL, ās'fō-gel ("carrion-bird"), the South African vulture, of several different species.

AB, the 11th month of the Hebrews' civil year and the 5th of their ecclesiastical (which begins with Nisan), has 30 days, and answers to the July moon, or part of our July and August. The 9th day was a great fast in memory of the destruction of the first temple by Nebuchadnezzar, 586 B.C., and the second by Titus, 70 A.D.

ABA or **ABU HANIFAH,** or **HANFA,** ä'ba or ä'boo hä-nē'fa, or hän'fa, surnamed Alnooma: b. in the 80th and d. in the 150th year of the Hegira (701–71) He is the most celebrated doctor of the orthodox Mussulmans, and his sect is the most esteemed of the four which they severally follow.

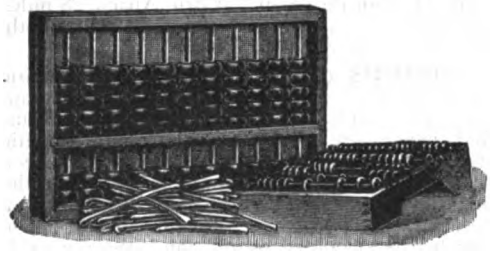
ABA, ä'ba, a mountain in Armenia, part of Mount Taurus, where the rivers Araxes and Euphrates have their rise.

ABĀBDA, äb âb'da, a wandering tribe of Hamitic Arabs found on the southern border of Egypt east of the Nile from Assuan to the Red Sea and north to Kena-Kosseir. They now number about 30,000, governed by an hereditary chief, but in ancient days were much more numerous. The more enterprising still carry on their old occupation of caravan guards, and others of trade carriers, and as dealers in herbs, drugs and gums. During the Mahdist wars of 1882–98 many enlisted in the Anglo-Egyptian troops. Under British rule they have advanced considerably and now engage profitably in agricultural and fishing industries. Self-styled "sons of Jinns," they are claimed to be descendants of the Troglodytes and Blemmyes of classic ages, the Gebadei of Pliny, who inhabited the same region.

ABACO, ä'ba-kō (or **Lucaya**), **Great** and **Little,** two Bahama islands 150 miles west of Florida. Great Abaco, the largest of the Bahamas, is about 80 miles long by 20 wide, with a lighthouse at its southeast point, at a natural perforation of the rock known to seamen as "The Hole-in-the-Wall." Little Abaco, 28 miles long, lies west of its north point. Area of both, 879 square miles; pop. 2,400.

AB'ACUS (Greek ἄβαξ, from the Semitic פבק, *abq,* dust). In mathematics, a term applied to several forms of reckoning apparatus, and hence for some centuries to arithmetic itself. The primitive form seems to have been a board covered with fine dust, whence the generic name. Among the Hindus this was a wooden tablet covered with pipe clay, upon which was sprinkled purple sand, the numerals being written with a stylus. (Consult Taylor, in the preface to his translation of the 'Lilawati,' Bombay 1816, p. 6). That this form was used by the ancient Greeks is evident from Iamblichus, who asserts that Pythagoras taught geometry as well as arithmetic upon an abacus. Its use among the Romans of the classical period is also well attested. Another form of the abacus, having many modifications, is a board with beads sliding in grooves or on wires in a frame. Herodotus tells us that this instrument was used by the Egyptians and the Greeks, and we have evidence that the Romans also knew it, although preferring a form described below. It is at present widely used in India and appears in the form of the *swanpan* in China, the *saroban* in Japan, and the *tschoty* in Russia, the latter being the same as the modern Arabian abacus. In its simplest form, the beads or counters are stored at one end of the frame and the computation is done at the other end by moving the correct number of

beads over against that side of the frame. Usually on a decimal scale, the separate wires represent units, tens, hundreds, etc., progressively, but a duodecimal scale is also in use, and among the Chinese there is a separate division horizontally across the frame below which units are counted up to five, and the fives transferred to the upper section where each bead stands for five units. In parts of India where English money is used the wires on the abacus represent pence, shillings, pounds, tens of pounds, hundreds of pounds, etc., there being 11 beads on the first wire, 19 on the second, and 9 on each one above. It is in this type of the abacus that prayer beads have their origin. The third form is a ruled table, upon which counters are placed, somewhat like checkers on a backgammon board, a game derived from this type of abacus. This was the favorite form among the Romans, whose numerals were not at all adapted to calculation, and it maintained its position throughout the Middle Ages and until the latter part of the 16th century. The Hindu-Arabic numerals (see NUMERICALS) having then supplanted the Roman, such an aid to calculation was thought superfluous in western Europe. The counters used were called *ψῆφοι* by the Greeks, *calculi* (pebbles, whence *calculare* and our *calculate*) by the Romans, and in Cicero's time *aera* because brass discs were used. In mediæval times they were called *projectiles* because they were thrown upon the table, whence our expression to "cast an account," and Shakespeare's "counter caster." The early French translated this as *gettons, gectoirs,* and *jetons,* whence our obsolete English *jettons* and the modern French *jeton,* meaning a medal, and also a counter for games. The Germans translated the late Latin *denarii supputarii*



(calculating pennies) as *Rechenpfennige,* the early printed books distinguishing between reckoning on the line (that is, on the ruled table) and with the pen. The Court of the Exchequer (q.v.) derives its name from this form of the abacus, about which the judges of the fiscal court sat. (Hall, 'The Antiquities and Curiosities of the Exchequer,' London 1891; Henderson, 'Select Historical Documents of the Middle Ages,' London 1892, p. 20.) Another form of the abacus, possibly introduced by Gerbert before he became Pope Sylvester II (q.v.), was arranged in columns and employed counters upon which the western Arab forms of the Hindu numerals (see NUMERALS) were written. The use of the term to designate an instrument of calculation led to its use for arithmetic itself, as in the 'Liber abaci' of Leonardo Fibonacci of Pisa (q.v.) and in the works of later writers.

Consult Knott, 'The Abacus' (in the 'Transactions of the Asiatic Society of Japan,' Vol. XIV); Bayley, in the *Journal of the Royal Asiatic Society* (N.S., Vol. XV); Chasles, in the *Comptes rendus,* t. 16, 1843, p. 1409; Woepcke, in the *Journal asiatique,* 6 ser., t. I. See FINGER NOTATION.

DAVID EUGENE SMITH,
Professor of Mathematics, Teachers College, Columbia University, New York.

ABACUS. In architecture, the flat stone forming the highest member of a column, next under the architrave and bearing its first weight. In the Tuscan, Doric, and Ionic orders, its four sides are arched inward, with generally a rose in the centre. In Gothic architecture it was variously employed, according to the architect's fancy.

ABAD' ("abode"), a suffix meaning town or city, common in Hindu and Persian names: as Allahabad, city of God; Hyderabad, city of Hyder; Secunderabad, city of Alexander.

ABAD'DON, in the Old Testament and the rabbinical literature, Sheol, the underworld, or the place of the lost in it: in Revelation (ix, 11) the King of the Abyss, Greek APOLLYON.

AB'ADIR, according to Augustine, the chief god of the Carthaginians; according to Priscian, a stone which Saturn swallowed by contrivance of his wife Ops, believing it to be his new-born son Jupiter, and hence worshipped with divine honors.

ABAKANSK', a mountain range in Siberia, extending from the upper Yenisei to the Tom River, parallel to the Altai Mountains. Also a town founded by Peter the Great in 1707, near the Abakan River; now renamed Minusinsk (q.v.).

AB'ALO'NE (Sp., origin unknown). Any one of the several species of *Haliotis* (ear-shells or sea-ears) found along the California coast. The shell is a spiral so broadly flattened as to make an oval saucer, around the edge of which is a row of holes through which the tentacles pass when extended. The animal lives on rocks near the shore, feeding on seaweed; when frightened it withdraws entirely beneath its shell and clings with surprising force to the rock. The shell is lined with a bright mother-of-pearl much used in arts and crafts. The animal itself is used as food by the Chinese and Japanese; quantities of them are dried and exported from California to the Orient. The name "abalone" is local, but marine gastropods of the same family are abundant in all seas not too cold, outside the western Atlantic. In the Channel Islands off the coast of France, a species known as *ormers, Fr.* '*oreilles de mer,*' is used as food. See EAR-SHELL.

ABANAH, ā-bā'nā, or **AMANAH** (Gr. Chrysorrhoas, now Baradá, "The cold"), one of the two famous "rivers of Damascus" mentioned in the Scripture: rising in the heart of the Anti-Lebanon, it flows through a narrow gorge and spreads fan-wise through the Damascus oasis, irrigating the land and supplying the city, by the canals or "rivers," with its clear sparkling water, so greatly superior to the Jordan in beauty that Naaman's question is quite intelligible.

ABANCAY, ä-bän-kī', Peru, capital of dept. Apurimac, 65 miles west of Cuzco, on the Abancay, an affluent of the upper Apurimac; in an East-Andean valley, the best sugar district in Peru, with large refineries and silver mines. Pop. about 3,000.

ABANDONMENT, the act of abandoning, giving up, or relinquishing.

In commerce it is the relinquishment of an interest or claim. Thus, in certain circumstances, a person who has insured property on board a ship may relinquish to the insurers a remnant of it saved from a wreck, as a preliminary to calling upon them to pay the full amount of the insurance effected.

The principle is also applicable in fire insurance, and often under stipulations in life policies in favor of creditors. The chief object of abandonment being to recover the whole value of the subject of the insurance, it is necessary only where the subject itself, or portions of it, or claims on account of it, survive the peril which caused the loss. At once upon receiving information of a loss the assured must elect whether to abandon, and not delay for the purpose of speculating on the state of the markets.

The English law is more restricted than the American, by not making the loss over half the value conclusive of the right to abandon, and by judging the right to abandon by the circumstances at the time of action brought, and not by the facts existing at the time of the abandonment. By commencing full repairs the right of abandonment is waived. An abandonment may be oral or in writing. When acted upon by another party, the effect of abandonment is to devest all the owner's rights.

In criminal law abandonment is the intentional desertion of a dependent by one under a legal duty to maintain him. A parent or guardian of the person of an infant is guilty of a misdemeanor if the child is injured through the act of the guardian, and of murder if death results. The offense is now defined in nearly all States. Consult Bishop 'Commentaries on Criminal Law' (Boston 1895); Wharton, A., 'Treatise on Criminal Law' (San Francisco 1912).

ABANO, Pietro d', ä'ba-nō, pēä'trō dē, known also as Petrus de Apono, one of the most celebrated physicians of the 13th century: b. in the Italian village from which he takes his name, in 1246 or 1250; d. 1316. He visited the East in order to acquire a thorough knowledge of Greek, and then completed his studies at the University of Paris. Returning to Italy he settled at Padua, where his reputation as a physician became so great that his rivals, envious of his fame, gave out that he was aided in his cures by evil spirits. It was known, too, that he practised astrology, and he was twice summoned before the Inquisition. On the first occasion he was acquitted, and he died before his second trial came to an end. Besides the work, 'Conciliator Differentiarum Philosophorum et Præcipue Medicorum' (Mantua 1472), he wrote 'De Venenis eorumque Remediis' (1472), 'Geomantia,' 'Quæstiones de Febribus,' and other works.

ABANO BAGNI, ä'ba-no bä ñī, Italy, a health resort in the province of Padua, 29 miles from Venice by rail. Already in ancient times its hot sulphur springs were famous among the Romans as a cure for diseases of the skin, the town being known then as Fons Aponi. Pop. 5,500.

ABAN'TES, an ancient Greek people originally from Thrace, who settled in Phocis, and built a town called Abæ. Their name implies an ancestor or leader Abas.

ABAR'BANEL. See ABRAVANEL.

AB'ARIM ("the beyonds," sc. Jordan), the edge of the Moabite plateau overlooking the entire Jordan valley: a range of highlands forming its whole horizon, broken only by the valley mouths of the Yarmuk, the Zerka, and the Jabbok. Its highest elevation is Mount Nebo, whence Moses had his "Pisgah view" of Palestine (see PISGAH), and whence Jericho is plainly visible. Ancient altars, perhaps Amorite, were discovered here in 1881.

AB'ARIS, the Hyperborean (fabled as from the Caucasus or thereabout), a legendary sage first mentioned by Pindar and Herodotus, 5th century B.C., but quite uncertain of date or existence. He had the prophetic gift, and a magic arrow of Apollo on which he rode through the air; cured by incantations, rid the world of a great plague, etc. The Neo-Platonists made him Pythagoras' companion.

ABASCAL, José Fernando, ä-bäs-käl', hō-sā' fĕr-nän'dō, Spanish soldier and statesman: b. Oviedo, 1743; d. Madrid, 1821. Entering service in 1762, he rose to brigadier-general in the French Revolutionary wars; in 1796 became viceroy of Cuba and defended Havana against the English fleet; then was commander in New Galicia, and later viceroy of Peru, where he showed great ability and kindliness, and in recognition of his efforts to reconcile natives and Spanish was created Marqués de la Concordia. He defended Buenos Aires from the English, and suppressed revolts in Lima and Cuzco; but having a turn of ill success was recalled in 1816.

ABASOLO, Mariano, ä-bä-sō'lō, mä-rēä'-nō, Mexican patriot: b. Dolores, Guanajuato, about 1780; d. Cadiz, 1819. Joining Hidalgo's (q.v.) Mexican revolution in 1810, he rose to major-general, and was noted for humanity to prisoners. After the final rout at Puente de Calderon, 17 Jan. 1811, he fled with his chief; with him was captured by the counter-revolutionists, tried at Chihuahua, and sentenced to imprisonment in Spain, where he died.

ABATEMENT. In law: (1) A removal or putting down, as of a nuisance. (2) A quashing; a judicial defeat; the rendering abortive by law, as when a writ is overthrown by some fatal exception taken to it in court. A plea designed to effect this result is called a plea in abatement. All dilatory pleas are considered pleas in abatement, in contradistinction to pleas in bar, which consider the merits of the claim. (3) Forcible entry of a stranger into an inheritance when the person seized of it dies, and before the heir or devisee can take possession. (4) The termination of an action in a court of law, or the suspension of proceedings in a suit in equity, in consequence of the occurrence of some event, as for example the death of one of the litigants. In contracts, a reduction made by the creditor in consideration of the prompt payment of a debt due by the debtor. In mercantile law, a deduction from

duties imposed at the custom-house, on account of damages received by goods during importation or while in the custom-house.

A misnomer of plaintiff or defendant can be taken advantage of only by plea in abatement.

In heraldry, an abatement was formerly an addition to a coat-of-arms, indicative of disgrace or inferiority; now it is confined to the bend sinister, marking illegitimate descent.

AB'ATIS, or **ABATTIS,** in military affairs, a defense made of felled trees. In sudden emergencies, the trees are merely laid lengthwise beside each other, with the branches pointed outward to prevent the approach of the enemy. When employed for the defense of a pass or entrance, the boughs of the trees are stripped of their leaves and pointed, the trunks are planted in the ground, and the branches interwoven with each other; and the abatis is laid in a depression in front of a trench, for protection from artillery fire.

AB'ATOS, Egypt, an island in Lake Mœris, famous as the sepulchre of Osiris, and for producing the papyrus of which the ancients made their paper.

ABATTOIR (Fr.), ab-at-war, a slaughter-house; sometimes extended to include a great market of which the abattoir proper is only a part. The nuisance of blood, offal, etc., in crowded settlements, early forced ancient civilized governments to put the slaughter of the animals under restrictions. Our first definite information on this point is the system under the Roman empire: the slaughter-houses instead of being scattered about the streets were collected in one quarter, forming the public market, which in Nero's time was one of the most imposing structures in Rome. The system was introduced into Gaul, but the meat supply of Paris was in the hands of a clique of aristocratic families who balked all attempts at reform; and though as far back as 1567 Charles IX had issued a decree on the subject, no improvement was made till Napoleon's time, when the nuisance was shocking,— slaughter-houses abutted on the principal thoroughfares, herds of footsore and lamenting beasts impeded traffic, the gutters ran with blood, offal poisoned the air, and the Seine was a sewer for it. A commission was appointed to rectify these conditions in 1810, and the five great abattoirs which still exist were formally opened 15 Sept. 1818. They have been the models of the world, and for many years had no rivals; indeed, for symmetry of arrangement they have never been surpassed. But of late the vast American establishments at Chicago, at Kansas City, St. Louis, Mo., Brighton, Mass., and other places, have carried speed, economy, and cleanliness to an ideal point, and American inventiveness has built up an incredible number of subsidiary industries and products, so that literally not a hair of an animal's body nor a drop of its blood is wasted: foods, medicines, chemicals, manures, building-materials, etc., produced from the refuse of the slaughter-houses are past numbering. The improved systems of the United States are of recent development and are due to the investigations of the methods followed in abattoirs in preparing meats and canned goods. These investigations revealed unsanitary conditions, and unwholesome and unhealthy practices. On 30 June 1906 Congress provided for the inspection of all meats destined for interstate or foreign trade and of all establishments engaged in the industry, and appropriated $3,000,000 per annum for the maintenance of this supervision. Federal inspection is now conducted in about 1,000 establishments located in 275 cities and towns. It reaches about 60 per cent of the total meat supply of the country, the remaining 40 per cent being under the supervision of State and local officers. In modern abattoirs great skill and speed are attained in the slaughtering and dressing of animals. The cattle are driven up to pens on a killing floor and are stunned by being struck between the eyes with a sledge hammer. The animal is then shackled, placed on the killing bed, and hoisted on a suspended tramway, and bled. It is next moved on to the "header", who skins and removes the head. The animal is then lowered and skinned, and passes through a row of butchers, each of whom performs some operation in trimming the dressed carcass. It is then shifted along to the cooling room and its place is at once taken by the next carcass on the run. By means of this specialization and division of labor a constant run is maintained, a force of less than 200 workers kill, dress and trim about 2,000 carcasses in a day of 10 hours. During the slaughtering, the carcasses are inspected by Federal meat inspectors, examining with care the viscera for indications of disease, or if animals are emaciated or in any way unsound the carcass is marked "U. S. Inspected and Condemned" and is turned into fertilizer. For hogs the process is different but the same subdivision and specialization of labor obtain; scalding vats and scraping machinery are added, and the carcasses are examined during the process as in the case of beef carcasses. The largest abattoirs in the United States, and in the world, are located at Chicago, Kansas City, St. Louis, Omaha, and Cincinnati. The Chicago Union Stock Yards is the largest concern of its kind in the world, covering an area of about 500 acres, and having an invested capital of about $70,000,000. About 8,000,000 hogs, 2,500,000 cattle, and 6,000,000 sheep are received and slaughtered annually. (See MEAT; PACKING INDUSTRY.) Consult Macewen, 'Food Inspection' (1910).

ABAUZIT, Firmin, ab-ō-zē, fēr-mañ French scholar of Arabian blood and Protestant parents: b. Uzès, 1679; d. Geneva, 1767. He lost his father when only two; in 1685, on the Revocation, the authorities tried to tutor him for a Catholic, but his mother contrived his flight with an elder brother to the Cevennes, where after two years as fugitives they gained Geneva, and the mother escaped from imprisonment and joined them. He early acquired great proficiency in languages, physics, and theology; traveled to Holland and made acquaintance with Bayle and others, and to England, where Newton admired him greatly, corrected through him an error in his "Principia," and wrote to him, "You are well worthy to judge between Leibnitz and me." William III wished him to settle in England, but he preferred to return to Geneva: assisted a society there in translating the New Testament into French, was offered but refused a chair in the university, but accepted a sinecure librarian-

ship, and died very aged. He was of wonderful versatility and universality, seeming to have made everything a speciality; Rousseau, jealous of every one, yet eulogized him warmly; and Voltaire asked a flattering stranger who said he had come to see a genius, whether he had seen Abauzit. His heirs, through theological differences, destroyed his papers, so that little remains of his work; he wrote articles, however, for Rousseau's 'Dictionary of Music' and other works, and edited with valuable additions Spon's 'History of Geneva.' Collected works, Geneva, 1770; London, 1773. Translations by Dr. Harwood, 1770, 1774. For personal information, consult Senebier's 'Histoire Littéraire de Genève'; Harwood's 'Miscellanies'; Orme's 'Bibliotheca Biblica' (1834).

ABAZA, Alexsander Agreievich, ä-grā-yä'vich, äbä'zä, Russian statesman: b. 1821; d. Nice, 1895. He was descended from a noble family of Moldavia, completed his education at the University of Petrograd and, in 1839, entered the military service in which he distinguished himself in the Caucasus, being wounded several times and being invested with the order of St. Vladimir. However he abandoned the service and joined the educational and humanitarian circles presided over by Grand Duchess Helena Pavlovna. He soon was appointed master of ceremonies at the court of the princess. In 1865 he was elected a member of the council in the Ministry of Finance in which capacity he rendered important service to the financial and economic department of his vast country. He retired from public life in 1892 and, until his death, traveled extensively through Europe. He was not in favor of the reforms of Alexander II (q.v.), which were passed before he had any substantial power in his hands to oppose them effectively. But as Minister of Finance he suddenly changed and became one of the most fervent supporters of the reforms.

ABBA ARIKA, ä-rē'kä, also known as "Rab," a Jewish scholar of Babylonia and the son of a distinguished family. He studied at Sepphoris, then went to Sura where he founded the academy of that name. He was one of the leaders of Jewish thought in Babylonia.

ABBA MARI, mä'ri (correctly ABBA MARI BEN MOSES BEN JOSEPH DON ASTRUC OF LUNEL), a French Hebrew who achieved fame as leader of the opposition to the growing rationalism of Maimonides, in the Montpellier controversy of 1303–06. He was born at Lunel near Montpellier, but the dates of his birth and death are unknown. His correspondence with Solomon ben Adret, rabbi of Barcelona, published under the title of 'Minhat Kenaot — Jealousy Offering,' accentuates the three cardinal doctrines of orthodox Judaism, and throws much light on the question of the relation of religion to the philosophy of the age.

ABBA (same as papa, etc.), Aramaic form of Hebrew for "father." In the New Testament, used as an address to God; in the Talmud, a scholar's title of honor; also used as part of proper names; and at present the title of Syriac, Coptic, and Ethiopic bishops. See POPE.

ABBADIDES, a-bäd'idz, a Mohammedan dynasty founded in Spain in 1023 by Abd-al-Kasim Mohammed and maintained by his son, Abbad, El Motaddid (1042–68) and his grandson, El Motamid (1068–91), all three men of remarkable personality. They were recognized as the leaders of the Moslems of Arabic or Spanish descent against the Berbers of Granada. They have been the subjects of many romances and even to-day they are the heroes of many legendary tales told among the Spanish peasants. After the capture of Toledo by Alphonso VI of Castile in 1085 El Motamid found himself in so desperate a position that he was obliged to call the Almoravides to his assistance. His duplicity soon caused a breach between himself and his allies, in 1091 Seville was captured and El Motamid was made a prisoner by the Spaniards, thus bringing the Abbadides dynasty to an end. In 1095 he died in prison.

ABBADIE, Antoine Thomson and Arnaud Michel d', dab-ad-ē, äṅ-twan toṅ-soṅ and ar-nō mē-shel, French brothers and explorers: b. Dublin, Ireland, 3 Jan. 1810: and 24 July 1815; d. 1897 and 1893, respectively. In 1837–48 they explored Abyssinia and Upper Egypt, traveled up the White Nile, visited Darfur (regarded by the English in these places as French emissaries), and made a remarkably large collection of Ethiopic and Amharic manuscripts. Among other works Antoine published 'Geodesy of Part of Upper Ethiopia' (1860–73) and 'Dictionary of the Amarin Language' (1881); and Arnaud, 'Twelve Years in Upper Ethiopia' (1868).

ABBADIE, Jacques, ab-ad-ē, zhak, or **James,** French-English divine: b. Nay, Bern, c. 1654–57; d. London, 1727. A poor boy, educated by friends, he took a degree of doctor in theology at Sedan at 17, was minister of a French Protestant church in Berlin some years, then in 1688 accompanied Marshal Schomberg to London for the second English Revolution, and became minister of the French church in the Savoy. He was strongly attached to William's cause, wrote an elaborate defense of it, and a history of the conspiracy of 1696 from materials furnished by the government; and William made him dean of Killaloe, Ireland. A very able man and eloquent preacher, Abbadie is best known by his religious treatises in French, several of them translated into other languages: the most important are: 'On the Truth of the Christian Religion,' with its sequel 'On the Divinity of Jesus Christ,' and 'The Art of Self-Knowledge.'

ABBAS (IBN ABD IL MUTTALIB, 'bn äbd il moo-tä'lib), uncle of Mohammed; at first hostile to him, but ultimately — after the defeat at Bed'r (see MOHAMMED) — the chief promoter of his religion. He was the founder of the Abbasside (q.v.) caliphate at Bagdad.

ABBAS I, of Persia, "the Great," 7th shah of the Sufi dynasty: b. 1557, acceded 1585: d. 27 Jan. 1628. Sent to Khorasan as nominal governor in childhood, at 18 he was proclaimed shah by its nobles, smarting under the oppression of his father Mohammed Khodabendeh's officers; the father was soon driven from the throne. At this time the Turks had invaded the western Persian provinces, and the Uzbek Tartars occupied and ravaged Khorasan. Abbas first transferred his residence from

Kasbin to Ispahan; he then by treaty confirmed to the Turks all their conquests, to gain time for chastising the Uzbeks, whom in 1597 he surprised and routed near Herat, and followed this by the conquest of Ghilan, Mazanderan, much of Tartary, and nearly all Afghanistan. He then declared war against the Turks; and in 1605, with 60,000 men, annihilated their army of nearly double the number at Basra (Bussorah), recovering all the lost provinces, and not only securing complete immunity from Turkish aggression for the rest of his life, but extending his empire beyond the Euphrates. In 1611 he dictated to Achmet I a treaty which gave Persia Shirwan and Kurdistan. In 1618 he routed the united Turkish and Tartar armies near Sultanieh, securing more territory; and on the Turks renewing the war in 1623 he captured Bagdad after a year's siege. The same year he took Ormuz from the Portuguese; and when he died his dominions reached from the Tigris to the Indus. His internal administration was no less firm and beneficial. He encouraged commerce, built highways, repressed violence, and left the country flourishing as it never has since. He was favorable to foreigners, and two Englishmen, Sir Anthony and Sir Robert Shirley, had much influence over him. He was like Herod in every respect: a jealous and cruel tyrant to his family,—he slew his eldest son and blinded his other children,—his country alone felt his good side. (See PERSIA). Consult Markham, C. R., 'General Sketch of the History of Persia' (London 1874).

ABBAS, Kuli Khan (NAWAB), Persian diplomat: b. 1864. The son of Nawab Jafer Kuli Khan, he was educated in England and became interpreter to the British legation at Teheran in 1885. He was appointed third secretary in the British diplomatic service in 1901; was the Persian special envoy at King Edward's coronation, and on the Shah's visit to England in 1902; in 1903 received the order of the C. M. G., and was a member of Viscount Downe's special mission to Persia. In 1908 he became head of the Oriental Chancery of the British Legation at Teheran.

ABBAS-MIRZA, Persian prince and warrior, favorite son of the shah Feth-Ali: b. 1783; d. 1833. He was early convinced of the advantages of Western civilization, and with the help of European officers he first of all applied himself to the reform of the army. He led the Persian armies with great bravery, but with little success, in the war with Russia ended by the peace of Gulistan, when Persia lost her remaining Caucasus districts and ceded to Russia the sovereignty of the Caspian; and in that of 1826–28, ended by the peace of Turkmanchai, when she lost most of Persian Armenia. In 1829 he visited St. Petersburg, to ward off punishment for the murder of the Russian ambassador in a riot at Teheran; and was sent back to Persia loaded with presents. His eldest son acceded to the throne in 1834.

ABBAS PASHA I, viceroy of Egypt, grandson of the famous Mehemet Ali: b. 1813; d. 13 July 1854. Early initiated into public life, in 1841 he took an active part in his grandfather's Syrian war; in 1848 the death of his uncle Ibrahim Pasha called him to the viceregal throne at Cairo. During his brief reign he did much to undo the progress made under Mehemet Ali: he dismissed all Europeans and fought Western ideas energetically. At the outbreak of the Crimean war he placed 15,000 men and his fleet at the Sultan's disposal; but was shortly after found dead, not without suspicion of foul play.

ABBAS PASHA II, Hilmi, hĕl'mē, third Khedive of Egypt: b. 14 July 1874, the eldest son of the Khedive Mehemed Tewfik, better known as Tewfik Pasha, was educated with his brother at the Theresianum in Vienna. Abbas Hilmi was declared to be officially of age in 1891, and on the death of his father (7 Jan. 1892) was proclaimed Khedive of Egypt in accordance with the Sultan's *firman* of 8 June 1873, by which the succession was to fall from father to son instead of from brother to brother. Despite the British occupation of Egypt since 1882, that country was — at least nominally — under Turkish suzerainty down to December 1914. The activities of Abbas Hilmi as a ruler were limited to following the advice of Lord Cromer, Sir Eldon Gorst, and, later, of Lord Kitchener, successively British Consuls-General in Egypt. At the outbreak of the European War (1914) the Khedive was in Constantinople, the guest of the Sultan, and was credited with devoting his energies to plotting against the British rule in his country. Great Britain declared war on Turkey (5 November) in consequence of hostile acts committed by Turkish troops. On 18 December the British Foreign Office issued a statement to the effect that in view of the state of war arising out of the action of Turkey, "Egypt is placed under the protection of His Majesty and will henceforth constitute a Protectorate. The suzerainty of Turkey over Egypt is thus terminated and His Majesty's Government will adopt all measures necessary for the defense of Egypt and the protection of its inhabitants and interests." A further announcement next day referred to Abbas Hilmi, "lately Khedive of Egypt," who had adhered to the King's enemies, and stated that he had been deposed. The title of Khedive was abolished for that of Sultan and conferred on the eldest living descendant of the family of Mehemet Ali, Prince Hussein Kamel Pasha who died 5 Oct. 1917 and was succeeded by Prince Ahmed Fuàd. Consult Cromer, Earl of, 'Abbas II' (London 1915).

ABBASSIDES, ăbăs'sĭdz, **The**, 750–1517, caliphs at Bagdad and later in Egypt; nominal sovereigns of all Islam, but losing Spain at the outset, and never practically obeyed in Africa outside Egypt; the most famous dynasty of Saracen sovereigns. They took their name from Abbas (q.v.), the uncle of Mohammed. This descent had given the family great influence by a century after the Prophet's death; and Ibrahim, fourth in descent from Abbas, had gained several victories over the Ommiads (q.v.), supported by the province of Khorasan, when the Ommiad caliph Merwan defeated and put him to death in 747. His brother Abu 'l-Abbas, whom he had named his heir, assumed the title of caliph, crushed the Ommiad dynasty in a decisive battle near the Zab (750) and acceded to their position. Its members and relatives were nearly all tolled into one spot and exterminated, earning for Abu 'l-Abbas the nickname of As-Saffah, "the butcher"; but one of them, Abder-Rahman (q.v.),

escaped, and after picturesque adventures set up an independent emirate in Spain, which toward two centuries later took the title of caliphate. On Abu 'l-Abbas' death, his successor Al-Mansur removed the seat of royalty to Bagdad, and won successes against Turkomans and Greeks in Asia Minor; but by this time the warlike impulse had begun to decay, and the love of luxury and its literary and artistic attendants to come to the front. Means were found of evading the strictness of Mohammedan rules; and no courts of any age or country were gayer or more splendid than those of the great Harun al-Rashid, Charlemagne's contemporary (786–809), and Al-Mamun (813–33). The splendor of their palaces, their decorations, their equipages, and the seemingly exhaustless treasures they possessed, gave them a world-wide celebrity — especially in contrast with the poverty-stricken barrenness and barbarism of most Christian sovereigns at that period — which is vivid even yet in literature and popular memory: Harun is the chief princely figure of the 'Arabian Nights,' and Bagdad the centre of all picturesque and varied enjoyment. Al-Mamun is still more honorably remembered as the patron of arts and literature. What lay underneath this external gorgeousness — the corruption, the furies of jealousy and bloodshed, and the barbarous oppression of the many — is outside a notice like this. But external decay soon began to witness internal rottenness. The Ashlabites, Edrisites, etc., carved out independent sovereignties in Africa; the Taherites in 820 set up a separate power in Khorasan, even under the great Al-Mamun. The Greeks, under the new life of the Byzantine empire brought in by Leo the Isaurian (q.v.), pushed them back in Asia Minor; and Al-Mamun's last years were contemporary with the philosopher, soldier, and statesman, the all-accomplished Emperor Theophilus. But the final stroke came from barbarians. The caliph Motassem (833–42), who had fought both Theophilus and the hordes of Turkestan successfully distrusting his subjects, formed bodyguards out of his Turkish prisoners. They soon became what the Roman prætorians were — masters of the empire. Motassem's son Motawakkel was assassinated by them in his palace (861) and the succeeding caliphs were their puppets; and in 936 the caliph Radhi (934–41) was forced to give up the command of the army and other powers to his general and mayor of the palace, Mohammed ben Rayek. The provinces one after another threw off allegiance; the caliph held only Bagdad and its neighborhood; and at last Hulagu, prince of the Mongols, fired Bagdad and slew the reigning caliph Motassem in 1258. The Abbassides retained a nominal caliphate in Egypt under the ægis of the Mamelukes, and never gave up the claim or the hope of their old position and seat; but in 1517 the Turkish Sultan Selim I, the conqueror of Egypt, bore the last of them, Motawakkel III, a prisoner to Constantinople, finally allowing him to return to Egypt, where he died a Turkish pensioner in 1538. Consult Muir's 'Caliphate' for the best English account; the monumental treasure-house of information for scholars is Weil's great 'Geschichte der Chalifen' (Mannheim and Stuttgart 1846–62). Consult also Muller 'Der Islam in Morgen-und Algadland' (1887).

ABBATE, äb-ä'te, or **ABATI**, ä-bä'tē, **Nicolo**, nē'kō-lō, Italian painter, follower of Raphael and Corregio: b. 1512 at Modena, where his earlier works are exhibited; d. 1571 at Fontainebleau — his frescoes in which palace are his best-known productions. His finest piece, however, is regarded as 'The Adoration of the Shepherds,' at Bologna, where his later work mostly exists. He has another in the Dresden gallery.

ABBAYE, a military prison near St. Germain des Prés, Paris, where 164 prisoners were murdered by infuriated republicans led by Maillard 2–3 Sept. 1792.

ABBAZIA, ä'bä-tsē'ą, a popular health resort on the Adriatic, in Austria, nine miles northwest from Fiume. On account of its sheltered situation it has an equitable climate, the temperature seldom dropping below 50° F. in winter or rising above 77° F. in summer. It is frequented by over 40,000 visitors annually and is a favorite resort for yachtsmen. One of its most prominent features is the Carol Promenade, built in 1896 by the King of Rumania. Resident population, 3,000.

ABBE, Cleveland, American meteorologist: b. New York city, 3 Dec. 1838; d. Chevy Chase, Md., 28 Oct. 1916. His education was received at the New York Free Academy, now the College of the City of New York, where he made a record in mathematical and mathematico-physical science. He was graduated in 1857 and then taught mathematics at the Trinity Latin School for a year. Later he studied astronomy under Professor Brünnow at the University of Michigan. A year afterward he removed to Cambridge where he spent four years with Dr. B. A. Gould and did telegraphic longitude work for the United States Coast Survey. During 1865–66 Professor Abbe studied at the Observatory of Poulkova, Russia, then under the direction of the illustrious Otto Struve, and finally, in 1867, he returned to this country and became connected with the National Observatory in Washington. He was immediately appointed Director of the Cincinnati Observatory. Professor Abbe took charge there in May 1868 and immediately became prominent through his offer to the Chamber of Commerce to make daily predictions of the weather for the benefit of the citizens. From a scientific standpoint this was then unheard of. However, it was soon seen that he had «inside information» on the all-important subject, the weather, and during September 1869 his offer was accepted, and the daily publication of weather bulletins and «probabilities» began.

His weather service met with instant success, and soon his friends had a resolution introduced into Congress providing for the establishment of a national bureau of storm warnings for the benefit of commerce, which bureau was opened in February 1870 with Gen. A. J. Myer, Chief Signal Officer of the Army, in charge. He immediately adopted all Professor Abbe's systems and methods, and in January 1871 invited him to come to Washington as his scientific assistant. A month later Professor Abbe commenced the regular tri-daily issue of «probabilities,» which he kept

up himself until he could train others to do the work correctly. These forecasts were published all over the country anonymously as official documents, and earned for Professor Abbe the cognomen of "Old Prob." From that time the weather service was extended each year until the United States Weather Bureau came to rank first among such services the world over, and Professor Abbe came to be regarded as the world's foremost meteorologist. It was largely due to his initiative that several successful advances were made in the service, such as ocean meteorology, the introduction of uniform standard time, and a great many other steps were taken. Professor Abbe continued in the Government service even when well past 70 years of age. He continued to edit the *Monthly Weather Review* and made many other contributions to meteorological science. In addition, he was editor of the *Bulletin* of the Mount Weather Observatory from 1909, professor of meteorology at Washington University from 1886, and lecturer on meteorology at Johns Hopkins University from 1896. He was a member of the National Academy of Sciences and of many other foreign and domestic scientific bodies.

One of Professor Abbe's most noteworthy achievements was his 'Report on Standard Time' (1879), which started the agitation that resulted in the establishment of the modern standard hour meridians from Greenwich. He was the author of a number of books on meteorological subjects, including 'Meteorological Apparatus and Methods' (1887); 'Studies for Methods in Storm and Weather Predictions' (1889); 'Mechanics of the Earth's Atmosphere' (Vol. I, 1891; Vol II, 1909); 'The Altitude of the Aurora' (1896); 'Physical Basis of Long-Range Forecasting' (1902); 'Solar Spots and Terrestrial Temperature,' and 'Atmospheric Radiation.'

ABBE, Cleveland, Jr., American geographer and geologist, son of Cleveland Abbe: b. Washington, D. C., 25 March 1872. After graduating from Harvard University in 1894 he took up a post-graduate course at Johns Hopkins University, receiving his degree of Ph.D. in 1898. In 1894, on graduating from Harvard, he was appointed instructor in physiography at the Corcoran Scientific School of Columbian, now George Washington University, which position he held until 1897. From 1896 until 1901 he was an assistant in the Maryland Geological Survey and, at various times during this period, taught geology and biology in the Western Maryland College. In 1899 he was appointed acting professor of natural sciences in the Winthrop Normal and Industrial College in South Carolina. In 1901 he left this position to follow a two years' special course in geography at the Imperial University, Vienna. Upon his return, two years later, he was appointed aid in the United States Geological Survey and, in 1906, he became research observer in the Weather Bureau. From 1908 to 1910 he was assistant editor of the *Monthly Weather Review*, after which he was appointed assistant librarian of the Weather Bureau.

ABBE, Ernst, German physicist: b. Eisenach, 1840; d. Jena, 1905. Studied at Jena and Gottingen; became assistant at the latter's observatory, and lecturer before the Frankfort-on-the-Main Physical Society; 1863–70 lecturer at Jena, and 1870 professor there; 1878 director of its observatories; in 1891 he resigned professorship. He became distinguished for his work in perfecting optical instruments, especially photograph and microscope lenses, having for a long time been connected with the highly reputed firm of Carl Zeiss in Jena. He invented the Abbe refractometer. He wrote a work in German on the 'Refracting and Dispersing Power of Solid and Fluid Bodies.'

ABBE, Truman, American surgeon, son of Cleveland Abbe and brother of Cleveland Abbe, Jr.: b. Washington, D. C., 1 Nov. 1873. After his graduation from Harvard University, in 1895, he studied medicine at the College of Physicians and Surgeons, at Columbia University, New York, gaining his degree of M.D. in 1899. After a year's post-graduate course at the University of Berlin he served for two years in several hospitals in New York city. In 1902 he was appointed instructor of physics and physiology at Georgetown University and in the following year surgery was added to his subjects. In 1905 he became instructor in physiology at George Washington University and in 1909 he became also instructor in surgery at the same institution. From 1906 to 1910 he was chief surgeon of the Garfield Surgical Dispensary. In 1907 he was awarded a silver medal at the Jamestown Exposition for his researches into the use of radium as applied to medicine. Besides his many articles on radium in medical journals he contributed to Vol. III of Wharton and Stiller's 'Medical Jurisprudence' (1905), and (with F. H. Bowlby) wrote 'Physical Conditions and Treatment.'

ABBÉ, ab-ā, originally the French name for an abbot, but later used in the general sense of a priest or clergyman. By a concordat between Pope Leo X and Francis I in 1516, the French king had the right to nominate upward of 200 *abbés commendataires,* who drew a third of the revenues of the monasteries without having any duty to perform. They were not necessarily clergy, but were expected to take orders unless exempted by a dispensation. The hope of obtaining one of those sinecures led multitudes of young men, many of them of noble birth, to enter the clerical career, which however seldom went further than taking the inferior orders; and it became customary to call such aspirants abbés, jocularly, Abbés of St. Hope. They formed a considerable and influential class in society; and an abbé, distinguished by a short violet-colored robe, was often found as chaplain or tutor in noble households, or engaged in literary work. This class of nominal clergy disappeared at the Revolution. In Italy they are called *abbate.*

ABBESS, the female superior of some convents of nuns, corresponding to the abbot over monks. She was elected from the monastery by secret votes, inducted by a bishop's consecration, and held office three years or even for life unless deprived for misconduct. The Council of Trent fixed the required age at 40, with eight years of professed membership in the monastery. She could discipline and even expel the nuns, subject to the bishop; but, being a female, could exercise only certain functions, such as

giving religious counsel and administering the rule, but no spiritual jurisdiction, as ordaining, conferring the veil, or excommunicating.

ABBEVILLE, France, ab-vēl ("abbey-town," of St. Riquier's), capital of Abbeville arrondissement, dept. Somme; 28 miles northwest of Amiens on both banks of the Somme and an island in it, 12 miles from its mouth and head of navigation (at high tide vessels of 150 to 200 tons can reach it) connected by canals with Amiens (25 miles distant), Lille, Paris, and Belgium; on the Northern Ry. It is an old, narrow-streeted, picturesque town, with strong fortifications on Vauban's system; has a wonderfully fine church of the flamboyant order, St. Wolfran's, begun under Louis XII (1462–1515), a very interesting city hall built in 1209, and a library of 1690 now containing 45,000 volumes. It manufactures jewelry, soaps, glassware, and various fabrics, as velvets, cottons, linens, etc. But its chief interest to the foreign world is for the relics and implements of primitive man (the cave-dweller) and the fossils of extinct animals found in its neighborhood. Pop. (1914) 20,373.

ABBEVILLE, S. C., county seat of Abbeville County; on the Southern and Seaboard A. L. railways; 105 miles west of Columbia. It is in a rich cotton-growing region; is noted for its fine climate, which makes it a popular resort for Northern invalids, and has a national bank, excellent public schools, several large manufactories connected with the cotton industry, railroad repair shops, flour and feed mills, brickyards, etc. Property valuation over $500,000; bonded debt less than $55,000. Pop. (1910) 4,459; (1917) 5,000.

ABBEVILLE TREATIES. (1) A treaty in 1259 between Louis IX of France ("St. Louis") and Henry III of England, to settle definitely the territorial rights of the two crowns, Louis fearing that his title to some possessions was liable to dispute, and having sought a settlement for many years. It was negotiated at Paris with Simon de Montfort, Earl of Leicester, and signed by the two kings at Abbeville during Henry's visit to France, 1259–60, but dated back to 20 May 1259. Henry resigned all title to Normandy, Maine, Anjou, Touraine, and North Saintonge; Louis turned over Périgord, Limousin, South Saintonge, and some districts south of the Loire, to be held by Henry in fief, —a surrender which so enraged the inhabitants that they refused to celebrate Louis' birthday. Henry resigned the titles of Duke of Normandy and Count of Anjou, and agreed to do homage at Paris for those of Duke of Guienne and peer of France. (2) Between Henry VIII and Francis I in 1527, Wolsey representing England.

ABBEY, Edwin Austin, American artist: b. Philadelphia, 3 April 1852; d. London, 1 Aug. 1911; studied at the Pennsylvania Academy of Fine Arts; lived in New York and drew illustrations of a high order for periodicals, also painting water-colors, till 1883, when he removed to England. His two most individual qualities have been his love for English country life and scenery and for the old English poets and dramatists, both of which have resulted in notable illustrations (as of Shakespeare, Goldsmith, etc.) and paintings; and his ability as a colorist, though much of his work has been done without color. He had also deep intellectual and spiritual qualities; and all these faculties and tastes together combine in the famous panels of the 'Search for the Holy Grail' on the upper walls of the delivery room at the Boston Public Library He was elected member of the Royal Academy July 1898; was one of the American jurors on paintings in the Paris Exposition of 1900; and was commissioned by Edward VII to paint the coronation scene in Westminster Abbey. He married, in 1890, Miss Mary Mead of New York. Though many years resident in England Abbey never abandoned his American nationality. Consult Radcliffe, 'Schools and Masters of Painting' (1898), Müther, 'History of Modern Painting' (1896).

ABBEY, Henry, poet and journalist: b. Rondout, N. Y., 11 July 1842; d. 1911. He published several collections of pleasing verse: 'May Dreams' (1862); 'Ralph, and Others Poems' (1866); 'Ballads of Good Deeds' (1872); 'Collected Works' (1885; 3d ed. 1895); 'Phaethon' (1901); 'Poems' (1904).

ABBEY, Henry Eugene, American operatic manager: b. Akron, Ohio, 27 June 1846; d. 1896. He was engaged for several years in theatrical, and from 1883 in operatic management, producing Italian and German operas with the most distinguished singers of the day. Under his management Madame Adelina Patti made a tour of the United States in 1889–90.

ABBEY, a monastery or religious community of the highest class, governed by an abbot, assisted generally by a prior, sub-prior, and other subordinate functionaries; or, in the case of a female community, superintended by an abbess. A priory differed from an abbey only in being on a smaller scale, and governed by a superior named a prior. Abbeys or monasteries first rose in the East. Among the most famous abbeys on the European continent were those of Clugny, Clairvaux, and Citeaux in France; of St. Galle in Switzerland, and of Fulda in Germany; in England, those of Westminster, St. Mary's of York, Fountains, Kirkstall, Tintern, Rievaulx, Netley, Paisley, and Arbroath. The English abbeys were wholly abolished by Henry VIII at the Reformation. Abbeys were usually strongly built, with walls which served as a defense against enemies and within which were large buildings in which the occupants carried on the work to which they had been assigned. See ABBOT; MONASTERY.

ABBITIB'BI, a river, a lake, and a former important trading-post of the Hudson Bay Company in the Northwest Territories of Canada. The river is the outlet of the lake, about 49° N. lat., and flows into James Bay; the post is on the shore of the lake.

ABBO OF FLEURY, fle-rē, French theologian: b. near Orléans about 945; d. 1004. He studied at Rheims and Paris; acquiring great repute as a scholar and scientist (of the time). Oswald, Archbishop of York, induced him to teach for two years in the abbey of Ramsey and aid in restoring the monastic system; on his return to France he became abbot of Fleury and built up a thriving school there; was sent by Robert II (son of Hugh Capet) on two missions to Rome, 986 and 996, and each time succeeded in warding off a papal interdict. Later, while trying to reform the discipline of

the priory of La Réole, Gascony, he was killed. He wrote lives of the early popes down to Gregory I. Consult Life by his pupil Aimoin, in Latin, 'Vita Abbonis abbatis Floriacensis.'

ABBOT, Benjamin, American educator: b. New England, about 1762: d. Exeter, N. H., 25 Oct. 1849. He was a graduate of Harvard College, then became head of the Phillips Academy at Exeter, N. H., a position which he held for nearly 50 years, until 1838. Among his pupils were many who later became prominent figures in American history, notably Daniel Webster, George Bancroft, Edward Everett and Jared Sparks.

ABBOT, Charles, first Baron of Colchester, speaker of the British House of Commons: b. Abingdon, Berkshire, 14 Oct. 1757: d. 1829. After finishing his studies at Christ Church he entered government service and, after occupying many positions, finally became Speaker of the House in 1802, retaining this position for 15 years, when he was compelled to resign on account of ill health. He was also one of the trustees of the British Museum. His 'Diary and Correspondence' (1861) is of contemporary historical value.

ABBOT, Charles Greely, American astrophysicist: b. Wilton, N. H., 31 May 1872. After graduating from the Massachusetts Institute of Technology, in 1894, he was appointed assistant at the Smithsonian Astrophysical Observatory. In 1907 he was advanced to the position of acting director, becoming director a few months later. During this period he attracted much attention by his researches in solar radiation. In collaboration with S. P. Langley he completed and published the mapping of the infra-red solar spectrum, described in Vol. I of the 'Annals' of the Astrophysical Laboratory. More recently his studies have been of the total amount and variability of solar radiation, its absorption in the solar and terrestrial gaseous envelopes and its effects on climatic conditions. He has written numerous articles on the apparatus, methods and results of solar research, but his chief work is 'The Sun' (1911).

ABBOT, Ezra, American Biblical scholar: b. Jackson, Me., 28 April 1819; d. 21 March 1884. He studied at Phillips Exeter Academy, graduated at Bowdoin 1840, and after teaching in Maine and Cambridge, Mass., became in 1856 assistant librarian of Harvard. In 1872 he received a D.D. from Harvard, though a layman, and thence till death was professor of New Testament criticism and interpretation in the Cambridge Divinity School. His wide reading and wonderful verbal memory made him one of the foremost of textual critics and bibliographers; his mastery of the Greek New Testament text placed him beside the leading scholars of the world; and on the American New Testament Revision Committee, 1871–81, he was a chief agent in putting its work on an even level of authority with the English, in minute accuracy of scholarship as well as broad, acute judgment. Indifferent to fame, he gave his best work to collaborations or private assistance mostly unacknowledged and unrealized except by scholars. His most important individual book was on the 'Authorship of the Fourth Gospel' (1880), in which he announced the important discovery of Tatian's 'Diatessaron.' Of his other critical work, besides the great Revision, his half of the prolegomena to Tischendorf's Greek New Testament (1884–94), his additions to Mitchell's 'Critical Handbook of the New Testament' (1880), and his revision of Schaff's 'Companion to the New Testament' (1883), should be mentioned. As a bibliographer, his greatest fame was for the curious and exhaustive catalogue of relevant books he furnished for Alger's 'Critical History of a Future Life' (1864), and his notes to Smith's 'Bible Dictionary' (Am. ed. 1867–70). He also wrote many papers for periodicals. His monographs were collected by J. H. Thayer and published under the title 'Critical Essays' (Boston 1888). Consult Barrow 'Ezra Abbot' (Boston 1884).

ABBOT, Francis Ellingwood, American religious radical: b. Boston, 1836; d. 1903. He was graduated at Harvard 1859 and Meadville (Pa.) Theological School 1863. A Unitarian minister 1863–68, he started in 1870 *The Index*, an ultra-radical weekly devoted to religious and philosophical topics; and wrote 'Scientific Theism' (1886), and 'The Way Out of Agnosticism' (1890), besides notable magazine articles.

ABBOT, George, Archbishop of Canterbury: b. Guildford, Surrey, 19 Oct. 1562; d. 5 Aug. 1633. A cloth-worker's son, he studied at Balliol, Oxford, was chosen Master of University College 1597, and three times was vice-chancellor of Oxford. Dr. Abbot's name was second on the list of eight divines ordered in 1604 to prepare the present (King James) version of the Bible. In 1608 he went to Scotland with the Earl of Dunbar to arrange for a union of the English and Scotch churches. James took a great fancy to him, and, though Abbot had never held a parish, made him bishop of Lichfield and Coventry in 1609, transferred him to the see of London a month later, and less than a year afterward appointed him Archbishop of Canterbury. Flattery of the king is accredited as the cause of this astonishing rapidity of preferment; but once in his seat, at least, Abbot felt no need of such tactics. He opposed the scandalous divorce suit of Lady Frances Howard against the Earl of Essex, though the court favored and carried it. In 1618 he forbade the reading, in the Croydon church where he was, of the king's declaration permitting games and sports on Sunday, which the Puritans (to whom Abbot belonged) regarded as a permit to break the Sabbath, and the order to read it as a command to commit blasphemy. He promoted the marriage between the Princess Elizabeth and the Protestant Elector Palatine, and opposed the disastrous Spanish-marriage project of Prince Charles, and thereby won Charles', Laud's, and Buckingham's hatred. The king, however, remained his friend. In 1622 he accidentally killed a keeper while deer-hunting, and his enemies tried to have him disqualified for the involuntary manslaughter. The king made light of the matter, but had to refer it to a commission, which decided in his favor, and he was formally absolved and reappointed. He attended James in his last sickness, and crowned Charles. The latter, on Abbot's refusing to license a fanatical divine-right sermon, deprived him of his func-

tions and put them in commission; but, having to summon a parliament shortly after, was afraid of the effect and restored him. From that time he lived in retirement, leaving Laud in complete ascendancy. He wrote many works now forgotten, though one on the prophet Jonah was reprinted in 1845. A geography passed through numerous editions. Consult Gardiner, S. R., 'History of England.'

ABBOT, Henry Larcom, American military engineer: b. Beverly, Mass., 13 Aug. 1831; graduated at West Point 1854, and entered the engineer corps. Took part in the survey for a Pacific railroad and of the Mississippi River delta, served through the Civil War as engineer and artillerist, was wounded at Bull Run, and commanded the siege artillery before Richmond, an account of which he published in 1867. He was brevetted brigadier-general U. S. Army and major-general U. S. Volunteers. He long commanded the engineers' garrison at Willett's Point, N. Y., established an engineers' school, worked out the submarine defenses of the United States sea coast, and accomplished much in the improvement of mortar batteries and engineering equipment, etc.; was a member of the Gun Foundry Board and the Board of Fortifications and Defense, of that for the protection of the Mississippi basin, of that on the proposed canal from Pittsburg to Lake Erie, and of the technical Committee of the new Panama Canal Company. He drew the plans for the interior harbor at Manitowoc, Wis. He was retired in 1895. He has written besides 'Physics and Hydraulics of the Mississippi' (1861); 'Problems of the Panama Canal in 1905 and 1907.' He is a member of the Committee of the National Academy of Sciences to report on the slides obstructing the Panama Canal, appointed at the request of President Wilson in 1915.

ABBOT, Joseph Hale, American educator: b. Wilton, N. H., 26 Sept. 1802; d. 7 April 1873. He was graduated at Bowdoin in 1822, was tutor there 1825–27; and professor of mathematics Phillips Exeter Academy 1827–33; then taught a ladies' school in Boston; subsequently was principal of the Beverly, Mass., high school. He was for some years recording secretary of the American Academy of Arts and Sciences, and published valuable scientific papers in its 'Transactions,' besides writing on pneumatic and hydraulic problems, in which he made ingenious investigations. He was associate editor of Worcester's 'Dictionary of the English Language' (1860).

ABBOT, Samuel, American philanthropist: b. Andover, Mass., 25 Feb. 1732; d. 12 April 1812. He became a wealthy Boston merchant and gave $20,000 in 1807 toward founding Andover Seminary, with $100,000 more by will.

ABBOT, Willis John, American author and editor, grandson of John S. C. Abbot; b. New Haven, Conn., 16 March 1863. He was graduated from the University of Michigan in 1884. In 1892 he became managing editor of the Chicago *Times,* holding this position for about a year. From 1896 to 1898 he was on the editorial staff of the New York *Journal.* His chief works are: 'Blue Jackets of '61'; 'Blue Jackets of 1812'; 'Battle Fields of 1861'; 'The American Merchant Ships and Sailors' (1902); 'A Story of Our Navy for Young Americans' (1910); 'Panama and the Canal in Picture and Prose' (1913).

ABBOT ("father"), originally the head and ruler of a community of monks; in the Greek Church *hegumenos,* "leader," or archimandrite, "ruler of the fold," though the latter is oftener an abbot-general with *hegumenoi* under him. Among the Dominicans the head of a convent was called *præpositus,* a "provost," or *prior;* among the Franciscans *custos,* "guardian"; among the Camaldules *major.* The name survives in the orders derived from the Benedictines, as the Cistercians, Bernhardines and Trappists. The term "abbot" originated in the East, and was first applied to any monk noted for piety, but at length restricted to the superior. The first abbots were laymen like the rest of the monks in general; the lowest clergy took precedence of them, and for sacraments they had to attend the nearest church: but the extreme inconvenience or even impossibility of this when the monastery was in a desert or far from a town forced the ordination of the abbots. Abbots could attend councils, and the second Council of Nice, 787, allowed them to ordain monks to the inferior orders; and ultimately nearly all monks were ordained to some grade of the ministry. To this elevation was added that of allowing pluralities of abbacies, originally forbidden, and even in the 6th century allowed only in special cases; but it increased till early in the 10th century one German prelate had 12 abbeys under him, corresponding to the archimandrites of the East. Thus, and by the increase of numbers and corporate wealth in the great abbeys, the abbots themselves became prelates of vast power. Still another cause developed this,—the exemption of abbeys from control of the bishops. They were originally all subject to episcopal jurisdiction, and in the West generally continued so till the 11th century; this is expressly ordered in Justinian's code. The exactions of the bishops, however, rendered the exemption increasingly frequent; beginning in 456 the practice grew, and was much helped forward by Gregory the Great, who relieved many abbots from episcopal control and made them responsible directly to the Pope. By the 12th century this had become an evil of the first order in ecclesiastical government, the bishop usually having no authority whatever over the chief centres of religious and often secular power in his diocese; and one abbot, of Fulda in Germany, claimed precedence over the Archbishop of Cologne. Next came an encroachment on the functions of the bishops: from conferring the tonsure and the office of reader they came to be equally associated with the bishops in consecrations; and while originally the bishop chose the abbot from the monks of the house, and then the right of election was transferred to the monks, the abbots came sometimes to choose their own successors. This, however, was stopped in some countries by a counter-process; the popes in Italy and the kings in France assuming to themselves the right of appointment.

Otherwhere the choice was by secret election of and from the monks of the house, unless it furnished no fit candidate, when choice might

be made from another monastery of one well instructed himself and competent to instruct others, of legitimate birth and at least 25 years old. His election was for life. His power was absolute except as restricted by the canons of the Church. His exaction of deference in the routine of life was royal: all rose and bowed when he entered the church or chapter, his letters and orders were received kneeling, and no monk could sit in his presence or leave it without permission. They had immense political power, and were on equal terms of intimacy with the greatest in the realm. Many of the abbots were an honor to their countries, and their schools were seminaries of learning and virtue.

In time the title was improperly conferred on others who had no connection with monastic life, or sometimes even with the Church,—on the principal of a body of parochial clergy or the king's chaplain, and the chief magistrate of Genoa was called "Abbot of the People." Lay abbots, so called, originated in temporarily handing over the revenues of an abbey to some noble, or even the king, for a great public exigency, the noble being titular abbot, but enough of the revenues being reserved from sequestration to support the house. Once in lay hands they usually remained there, and most of the Frankish and Burgundian sovereigns and chief nobles in the 9th and 10th centuries were titular abbots of great monasteries, whose revenues they applied to their own uses. This often happened from the monastery's voluntarily placing itself under the "commendation" of some noble for protection; and there were sometimes two lines of abbots,—one lay, taking the major part of the income without service, the other clerical, doing the work. This was mostly reformed during the latter part of the 10th century. The Council of Trent restored to the monasteries the right of electing their abbots. The newly elected abbot is then confirmed by the bishop or in certain cases by the pope.

In convent cathedrals, where the bishop filled the place of the abbot, the superior's duties were performed by a prior. In other convents the prior was the vice-abbot. The superiors of cells, or small monastic establishments dependent on the larger ones, were also called priors; they were appointed by the abbott and held office at his pleasure. There were three classes of abbots: mitred abbots, croziered abbots, or those allowed to bear a crozier, and œcumenical abbots, ruling the houses of a province or a country. Abbots hold a rank immediately after bishops. Their mitres must be less costly than those of bishops, and they are assigned a temporary throne. There are now 17 mitred abbots in the United States, two in Canada, 10 in England, two in Ireland and one in Scotland. Consult Feazey, H. J., 'Monasticism'; Montalembert, 'Monks of the West' (ed. 1896, Vol. I); Bingham, 'Origines'; Martene, 'Rites of the Ancient Monasteries'; Gasquet (Cardinal), 'English Monastic Life' (London 1904); Taunton, 'English Black Monks of St. Benedict' (London 1898).

ABBOT OF JOY, from the French "Abbé de Liesse," a title conferred upon the head of a fraternity founded in Lille. He presided over the games that took place during the carnival at Arras and the neighboring communities, popularly known as the "Feast of the Ass."

ABBOT, The, by Sir Walter Scott. A sequel to 'The Monastery,' but dealing with more stirring situations. The time of the action is 1567–68. While the action goes on partly at Avenel Castel, and Halbert Glendinning of 'The Monastery,' as well as his brother Edward (now an abbot) figure prominently in the story, the reader finds that he has exchanged the humble events of the little border vale by Melrose for thrilling and romantic adventures at Lochleven Castle on its island in the lake, north of Edinburgh, where Mary Queen of Scots is imprisoned. The chief interest centres around the unfortunate queen. The framework of the tale it is claimed is historically true.

ABBOTSFORD, a fording-place of the Tweed near its confluence with the Yarrow; the name given by Sir Walter Scott to his property there bought in 1811, in memory of its use by the monks of Melrose Abbey, it being at the time known as the Clarty [Filthy] Hole. The site is a low hillside on the southern bank, overlooked by the Selkirks. At first only a villa, now the west wing of the pile, he was seized with the idea of founding a great feudal family of the old Scotch pattern, with this for a baronial seat; and gradually added other sections, copying old Scotch mansions or ruins, or special features of them, making an irregular, rambling, picturesque abode, "a romance in stone and lime." It remained in Scott's family for four generations, but has in recent years been leased to Americans. Consult Irving's 'Abbotsford' (London 1850); Lockhart's 'Life of Scott' (Edinburgh 1838); Scott, Mary 'Abbotsford' (New York 1893); Smith and Crockett 'Abbotsford' (ib., 1905).

ABBOTT, Alexander Crever, American hygienist: b. Baltimore, Md., 26 Feb. 1860. He was educated at Johns Hopkins University and at the universities of Maryland, Munich, and Berlin. He is a fellow of the College of Physicians in Philadelphia, and a member of numerous scientific societies; in 1900 was professor of hygiene and director of the laboratory of hygiene in the University of Pennsylvania. His publications include 'The Principles of Bacteriology' (1892, 1915); 'The Hygiene of Transmissive Diseases' (1899–1902), and numerous papers on bacteriology and hygiene.

ABBOTT, Austin, American law-writer, son of Jacob: b. Boston, 18 Dec. 1831; d. 1896. He was graduated at the University of the City of New York in 1851, and entered the practice of law; collaborated with his brother Benjamin in valuable legal compilations, digests, textbooks, etc.; was an able law lecturer, and dean of his alma mater's law school 1891–96. He was counsel for Theodore Tilton in the Beecher trial. With his brothers Benjamin and Lyman he wrote two novels, 'Cone Cut Corners' (1885) and 'Matthew Caraby' (1858).

ABBOTT, Benjamin, American revivalist: b. Long Island 1732; d. Salem, N. J., 14 Aug. 1796. A hatter's and then a farmer's apprentice, somewhat dissipated but a kind husband and father and a church-goer (whence his accounts of the pit from which he was rescued are probably dialectic), he was roused to intense

conviction of sin at 33 by an itinerant Methodist preacher, joined that Church with his children and his Presbyterian wife, and became one of the most remarkable revivalists of the time, producing wonderful conversions of the most hardened, and often sending hearers into convulsions. In the Revolution the Methodists were suspected of disloyalty, and more than once he was near being mobbed; but he always preached down his assailants, once turning from their purpose a gang of a hundred soldiers. Serving for 16 years as a local preacher, from 1789 he went on various circuits, and in 1793 was made an elder and sent to Maryland. He carried on his duties till death despite much enfeeblement; and his career has been one of the most stirring themes for exhortation in the Church.

ABBOTT, Benjamin Vaughan, American lawyer, eldest son of Jacob: b. 4 June 1830; d. 1890. He was graduated at the University of the City of New York in 1850, and practised law with his brothers Austin and Lyman. He compiled nearly 100 volumes of legal digests and reports. He drew up in 1865, as secretary of the New York Code Commission, the penal code which is the basis of the present one. In 1870 President Grant appointed him one of three commissioners to revise the United States statutes, which occupied three years, and compressed 16 volumes into one large octavo; thence till 1879 he was occupied on a great revision of the 'United States Digest.' Among his lesser works are 'Judge and Jury' (1880), collected contributions to periodicals; a Chautauqua book, 'The Traveling Law School'; and 'Famous Trials' (1880).

ABBOTT, Charles Conrad, author and naturalist: b. Trenton, N. J., 4 June 1843. He received an academical education, and took the degree of M.D. at the University of Pennsylvania in 1865. He is corresponding member Boston Society of Natural History; member American Philosophical Society of Philadelphia; Fellow Royal Society of Antiquaries of the North, Copenhagen; Assistant, Peabody Museum of American Archæology and Ethnology, Cambridge, Mass., 1876–89. Author: 'Primitive Industry' (1881); 'Naturalist Rambles about Home' (1884); 'Upland and Meadow' (1886); 'Waste-land Wanderings' (1887); 'Days Out of Doors' (1889); 'Outings at Odd Times' (1890); 'Recent Rambles' (1892); 'Travels in a Tree-top' (1894); 'The Birds About Us' (1894); 'Notes of the Night' (1895); 'A Colonial Wooing' (novel, 1895); 'Birdland Echoes' (1896); 'When the Century was New' (novel, 1897); 'The Hermit of Nottingham' (novel, 1897); 'The Freedom of the Fields' (1898); 'Clear Skies and Cloudy' (1899); 'In Nature's Realm' (1900); 'Archæologia Nova Cæsarea' (1907–09); 'Ten Years' Diggings in Lenâpè Land' (1912); Various Reports on Indian Stone Implements, in *American Naturalist* (1872), revised and enlarged as 'Stone Age in New Jersey' in Smithsonian Annual Report of 1876 In 1876 he announced the discovery, since confirmed by other archæologists, of traces of man in the Delaware River valley, dating from the first or «Kansan» ice-age and inferentially the preglacial period when man is believed to have entered upon the North American continent.

ABBOTT, Edward, American clergyman, son of Jacob: b. Farmington, Me., 15 July 1841; d. Boston, Mass., 5 April 1908. He was graduated at the University of the City of New York 1860, and at Andover Theological Seminary 1862; in 1863 was with the United States Sanitary Commission at Washington and in the field. He was ordained Congregational clergyman in 1863, and 1865–69 was pastor of the Pilgrim Church, Cambridge, Mass.; in 1879 was ordained Episcopal priest and was rector of St. James', Cambridge, till 1906; in 1889 he was elected missionary bishop of Japan, but declined. He was associate editor of the *Congregationalist* 1869–78, and editor of the *Literary World* 1878–88, and 1895–1903. Among his works are 'Conversations of Jesus' (1875); 'Paragraph History of the United States' (1875); 'Paragraph History of the American Revolution' (1876); 'Long Look Series,' juvenile (1877–80); memorial of his father (1882); and 'Phillips Brooks' (1900).

ABBOTT, Edwin Abbott, English theologian and Shakespearean scholar: b. London, 20 Dec. 1838; graduated at St. John's College, Cambridge; senior classic and Chancellor's medalist (1861). He was master at King Edward's School, Birmington, 1862–64, and at Clifton College; and head-master of the City of London School, 1865–89, raising it to a foremost rank in England. In the latter year he retired. He has been select preacher at Cambridge and Oxford. His works include the well-known 'Shakesperian Grammar' (1869, enlarged 1870), still a classic; 'Bacon and Essex' (1877); 'Philochristus' (1878), and 'Onesimus' (1882), two anonymous romances of the first age of the Church; 'Francis Bacon' (1885); 'Anglican Career of Cardinal Newman' (1892); 'St. Thomas of Canterbury' (1898); 'From Letter to Spirit' (1903); 'Johannine Vocabulary' (1905); 'The Son of Man' or 'Contributions to the Study of the Thoughts of Jesus' (1910); 'Light on the Gospel' (Eng. ed. 1912: Am. ed. 1913); 'The Fourfold Gospel' (1913).

ABBOTT, Emma (WETHERELL), American dramatic soprano: b. Chicago, Ill., December 1849; d. Salt Lake City, 5 Jan. 1891. Beginning her musical career in Plymouth Church choir, Brooklyn, N. Y., she studied abroad with Sangiovanni at Milan and with Delled Sedie, Wartel, and James at Paris; then joined Mapleson's troupe, made her début at Covent Garden, London, toured three years in Great Britain, and returning to the United States joined the Emma Abbott English Opera Company. She sang in 'Martha,' 'The Chimes of Normandy,' 'Faust,' and other popular operas and was one of the best known singers in America in her day. Consult Lahee, H. C., 'Famous Singers of To-day and Yesterday' (Boston 1898).

ABBOTT, Frank Frost, American Latinist: b. Redding, Conn., 27 March 1860; graduated at Yale 1882; Latin tutor at Yale 1885–91; associate professor 1892; 1894, professor of Latin in the University of Chicago; 1901–02 annual professor of the American school of classical studies in Rome; becoming associate chairman of the managing committee; 1908, professor of classics in Princeton University; a frequent contributor to classical periodicals

and associate editor of *Classical Philology*. He has written 'A History of Roman Political Institutions' (1901); 'The Toledo Manuscript of the Germania of Tacitus' (1903); 'A History of Rome' (1906); 'Society and Politics in Ancient Rome' (1909); 'The Common People of Ancient Rome' (1911); etc. He is vice-president of the American Philological Association.

ABBOTT, Gorham Dummer, American educator, brother of Jacob and J. S. C.: b. Hallowell, Me., 3 Sept. 1807; d. 31 July 1874. He was graduated at Bowdoin 1826, at Andover 1831. Ordained a Congregational clergyman, he became a teacher in New York; in 1845 with his brothers he established the Abbott Institute for females in New York city and in 1847 the Spingler Institute,—pioneers in women's higher education; the latter held a foremost rank in the United States for 30 years, and he left it in 1869 a rich man. He wrote didactic works, as 'The Family at Home,' 'Nathan W. Dickerman,' 'Pleasure and Profit'; also 'Mexico and the United States.'

ABBOTT, Jacob, American juvenile writer and educator: b. Hallowell, Me., 14 Nov. 1803; d. 31 Oct. 1879. He was graduated at Bowdoin 1820, studied at Andover, and was ordained a Congregational minister; professor of mathematics and natural philosophy at Amherst 1825–29; then established the Mt. Vernon girls' school in Boston, and in 1834 organized and was pastor of the Eliot Church in Roxbury. In 1839 he removed permanently to Farmington, Me., and devoted himself to literary work there and in New York, assisting also in female education (see the preceding title), writing extensively for the early *Harper's Monthly*, of which he was one of the chief bulwarks, traveling widely abroad, and writing the classic juveniles of which the 'Rollo Books' are the best known type,—neither their usefulness, their popularity, nor their charm, has yet vanished. He had an excellent dramatic sense, a healthy balance, a sound business practicality and a true understanding of and sincere sympathy with children, which makes his didactics charming to rightly constituted children; no boys and girls were ever less priggish than those in 'Rollo,' the conventional burlesques of which merely prove that the authors have not read the books, and even so are a testimony to their vitality. The chief of his more than 200 volumes are the 'Rollo Books' (28 vols.), the 'Lucy Books' (6 vols.), the 'Jonas Books' (6 vols.), the 'Franconia Stories' (10 vols.), the 'Marco Paul Series' (6 vols.), the 'Gray Family' series (12 vols.), the 'Juno Books' (6 vols.), the 'Rainbow Series' (5 vols.), and several other series of science and travel for the young; more than 20 of the series of illustrated histories to which his brother J. S. C. contributed, and 8 vols. of American history. He also edited historical text-books and compiled school readers.

ABBOTT, Sir John Joseph Caldwell, Canadian statesman: b. St. Andrews, Quebec, 12 March 1821; d. 1893. Graduated at McGill College, Montreal, he became a lawyer, and was regarded as among the best Canadian authorities on commercial law, being dean of the McGill College Law Faculty for 10 years. In 1859 he was elected to the Lower House of Quebec, representing Argenteuil until Confederation (1867), when he was returned to the Canadian House of Commons. In 1862 he was solicitor-general in the Sandfield Macdonald-Sicotte Cabinet. In 1887 he joined Sir John A. Macdonald's Cabinet as minister without portfolio, and on Macdonald's death in June 1891 became premier of the Dominion; but resigned from ill health November 1892.

ABBOTT, John Stephens Cabot, American author: b. Brunswick, Me., 18 Sept. 1805; d. Fairhaven, Conn., 17 June 1877. He was graduated at Bowdoin 1825, and Andover; was ordained Congregational minister 1830, and held pastorates at Worcester, Roxbury, and Nantucket, Mass. He resigned the ministry in 1844 and devoted himself to popular literature. A fertile writer like his brother Jacob, and with an interest in his own matter that gave a certain charm to his style and excited equal interest in uncritical readers, but with too little acumen and too much rhetoric for the solid historical subjects he had a passion for, he issued very many works useful in stimulating public curiosity in history, but of too little weight to endure. The most famous was the 'Life of Napoleon' contributed as a serial to *Harper's Magazine*, and a great popular success; others were 'The French Revolution,' 'Napoleon at St. Helena,' 'The Civil War in America' (1863–66); 'Napoleon III' (1868); 'Romance of Spanish History' (1879); 'Frederick the Great' (1871), and many volumes of small histories and biographies.

ABBOTT, Lyman, American clergyman and editor, third son of Jacob: b. Roxbury, Mass., 18 Dec. 1835. He was graduated at the University of the City of New York in 1853; studied law, and went into partnership with his brothers Austin and Benjamin in 1856; but feeling more inclined to the ministry studied theology with his uncle John Stephens Cabot, and was ordained in 1860. Till 1865 he was pastor at Terre Haute, Ind.; 1865–68 secretary of the Freedmen's Commission, residing in New York, also becoming pastor of the New England Church there; in 1869 resigned his pastorate for journalism and literature. He was successively editor of the "Literary Record" department of *Harper's Magazine*, and at the same time chief editor of the *Illustrated Christian Weekly;* then associate editor with Henry Ward Beecher of the *Christian Union*, now the *Outlook*, of which he became chief editor on Mr. Beecher's death in 1887, succeeding him also in the Plymouth Church pulpit, which he resigned in 1899 to devote himself wholly to literary work. Since that time he has devoted himself to the editorship of *The Outlook*, other occasional contributions to literature, and to preaching in various pulpits during seven or eight months of the year, generally in colleges. He has taken an active part in social and industrial reform and in the religious and theological movements of the time. His earliest works were two novels written in collaboration with his brothers Benjamin and Austin Abbott (see Abbott, Austin) published under the nom-de-plume, composed by the three first syllables of their names, "Benauly." The following is a list of his published volumes: 'Commentary on the New Testament. Mathew to Romans'

(1875); 'In Aid of Faith' (1886); 'Evolution of Christianity' (1892); 'Plymouth Hymnal' (1893); 'Christianity and Social Problems' (1896); 'The Theology of an Evolutionist' (1897); 'Life and Letters of Paul' (1898); 'Life and Literature of the Ancient Hebrews' (1901); 'The Rights of Man' (1901); 'The Other Room' (1903); 'Life of Henry Ward Beecher' (1903); 'The Great Companion' (1904); 'The Christian Ministry' (1905); 'The Home Builder' (1908).

ABBOTT, Nathan, American jurist and educator, son of Abiel Abbott: b. Norridgewock, Me., 11 July 1854. He was graduated from Yale College in 1877, then studied law in Boston University. For some years he applied himself to his private law practice in Boston, after which he became Tappan Professor of Law in the University of Michigan. In 1893 he was appointed professor of law in Northwestern University. In 1895 he became professor of law and Dean of the Law School at Leland Stanford University. After holding this position for 12 years he became, in 1907, professor of law at Columbia University, New York city. He is recognized as one of the leading authorities on the English and American law of real property.

ABBOTT, Thomas Kingsmill, Irish educator: b. Dublin, 26 March 1829; d. 1913. He was a graduate of Trinity College. In 1867 he was appointed to fill the chair of moral philosophy at the same institution, which position he held until 1872. From 1875 to 1888 he was professor of biblical Greek and from 1879 until 1900 he was professor of Hebrew. His works are: a translation of Kant's 'Introduction to Logic' (1878), and Kant's 'Ethics' (1909); 'Essays' (1892); 'The Elements of Logic' (1895); 'Commentary on Ephesians and Colossians' (1897); 'Elementary Theory of the Tides' (1901); 'Catalogue of 15th Century Books in the Library of Trinity College' (1905).

ABBOTT, Wilbur Cortez, American educator: b. Kokoma, Ind., 28 Dec. 1869. After graduating from Wabash College in 1892 he took a post-graduate course at Cornell University, then studied at Oxford, where he received a degree of B.Litt. in 1897. From 1893 to 1895 he was instructor in history at Cornell. In 1897 he became instructor in history at the University of Michigan. Two years later he was appointed assistant professor of history in Dartmouth College; in 1902 professor of history in the University of Kansas, and in 1908 he was appointed professor of history at the Sheffield Scientific School, at Yale University. He is the author of 'Colonel Blood, Crown Stealer' (1911).

ABBREVIATIONS or "shortenings" are used in writing to save time and space, or it may be to ensure secrecy. They are of two kinds, consisting either in the omission of some letters or words, or in the substitution of some arbitrary sign. In the earliest times, when uncial or lapidary characters were used, abbreviations by omission prevailed, such as we find in the inscriptions on monuments, coins, etc. The ancient copiers of MSS. invented many contractions to facilitate their labor. Greek MSS. abound in such, and hence often cannot be read without a previous regular study of Greek palæography. From MSS. these contractions were transferred to the printed editions of Greek authors, and have only been wholly disused within the past century; hence regular lists of them were given in the earlier Greek grammars, because the knowledge of them was absolutely essential to the student. Some of the commoner are still given in some grammars, as many Greek works are accessible only in editions full of them. Among the Romans the marks of abbreviation, called *notæ* or *compendia scribendi,* were so numerous that, in a classification by L. Annæus Seneca, they amount to 5,000. With the Latin language the ancient Roman abbreviations passed to the Middle Ages, appearing first on inscriptions and coins, then in manuscripts, and, more especially after the 11th century, in charters and other legal documents, and the practice continued in these long after the invention of printing had made it unnecessary in books. The use of them in legal documents was forbidden by an act of Parliament passed in the reign of George II. In ordinary writing and printing few abbreviations are now employed. The abbreviations by using the initials of words are chiefly confined to titles, dates, and a few phrases: A.M.— *Magister Artium,* Master of Arts; A.D.— *Anno Domini,* in the year of our Lord; F.R.G.S.— Fellow of the Royal Geographical Society. In the following list most of the abbreviations that are likely to be met with by modern readers are alphabetically arranged, save chemical elements, for which see table of ATOMIC WEIGHTS. The standard abbreviations used in library catalogues are also given. For Latin abbreviations see Campelli's 'Dizionario di Abbreviature' (Milan, 1899); Dobbs' 'Abbreviations, British and Foreign' (1911).

A.A.—Associate of Arts.
A.A.A.— Amateur Athletic Association (Brit.).
A.A.A.S.—American Association for the Advancement of Science.
A.A.P.S.—American Association for the Promotion of Science.
A.A.S.—*Academiæ Americanæ Socius,* Fellow of the American Academy (of Arts and Sciences); American Automobile Association.
A.A.S.S.—*Americanæ Antiquarianæ Societatis Socius,* Member of the American Antiquarian Society.
A.B.—*Artium Baccalaureus,* Bachelor of Arts.
A.B.C.F.M.—American Board of Commissioners for Foreign Missions.
Abp.—Archbishop.
Abr.—Abridgement, or Abridged.
a/c — Account.
A.C.— *Ante Christum,* before the birth of Christ.
Acad. Nat. Sci.— Academy of Natural Sciences.
Accel.— *accelerando,* In music, more quickly.
A.D.— *Anno Domini,* in the year of the Lord.
A.D.C.— Aide-de-camp.
Adjt.— Adjutant.
Adjt.-Gen.— Adjutant-General.
Ad lib.— *Ad libitum,* at pleasure.
Admr.— Administrator.
Admx.— Administratrix.
Ads.— *Ad sectam,* at the suit [of].
Ad v.— *Ad valorem,* at (or on) the value.
Æt.— *Ætatis,* of age; aged.

A.F.B.S.— American and Foreign Bible Society.
Agl. Dept.— Agricultural Department (Department of Agriculture.
A.G.S.S.— American Geographical and Statistical Society.
A.H.— *Anno Hegiræ*, in the year of the Hegira (Mohammedan era, reckoning from 622 A.D.)
A.H.M.S.— American Home Missionary Society.
A.M.— *Ante meridiem*, before noon; morning; *Anno mundi*, in the year of the world; *Artium Magister*, Master of Arts
Am. Ass. Adv. Sci.— American Association for the Advancement of Science.
Amer. Acad.— American Academy.
A.M.E.Z.— African Methodist Episcopal Zion.
Amt.— Amount.
An.— *Anno*, in the year.
A.N.A.— Associate of the National Academy.
Anat.— Anatomy.
Ang. Sax.— Anglo-Saxon.
Anon.— Anonymous.
Ant., or Antiq.— Antiquities.
A.O.S.S.— *Americanæ Orientalis Societatis Socius*, Member of the American Oriental Society.
Apoc.— Apocalypse.
Apocr.— Apocrypha.
App.— Appendix.
Apud.— In writings of.
A.R.— *Anna Regina*, Queen Anne; *Anno regni*, in the year of the reign.
A.R.A.— Associate of the Royal Academy.
Arch.— Archibald; Architect; Architecture.
Archd.— Archdeacon.
Arith.— Arithmetic.
Arm.— Armenian.
A.R.S.A.— Associate of the Royal Scottish Academy.
A.R.S.S— *Antiquariorum Regiæ Societatis Socius*, Fellow of the Royal Society of Antiquaries.
Assist. Sec.— Assistant-Secretary.
A.S.A.— American Statistical Association.
Assn.— Association.
A.S.S.U.— American Sunday-School Union.
Astrol.— Astrology.
Astron.— Astronomy.
A.T.S.— American Tract Society.
Atty.— Attorney.
Atty.-Gen.— Attorney-General.
A.U.A.— American Unitarian Association.
A.U.C.—*Anno urbis conditæ*, or *ab urbe condita*, in the year from the building of the city (Rome) B.C. 753.
A.V.— Authorized Version (of the Bible).
Ave.— Avenue.
Avdp. or Avoir.— Avoirdupois.
b.— Born.
B.A.— Bachelor of Arts.
Bal.— Balance.
Bapt.— Baptist.
Bart. or Bt.— Baronet.
Bbl.— Barrel.
B.C.— Before Christ; British Columbia.
B.C.L.— Bachelor of Civil Law.
B.D.— *Baccalaureus Divinitatis*, Bachelor of Divinity.
Bds.— Boards; Bonds.
Beau. & Fl.— Beaumont and Fletcher.
Belg.— Belgian; Belgium.
Benj.— Benjamin.
B.ès L.— Bachelor of Letters (Fr.).
Bib.— Bible; Biblical.
Bibliog.— Bibliographical; Bibliography.
Biog.— Biography; Biographical.
Bk.— Book.
B.L.— Bachelor of Letters.
B.Litt.— Bachelor of Literature in Journalism.
B.LL.— *Baccalaureus Legum*, Bachelor of Laws.
B.M.—*Baccalaureus Medicinæ*, Bachelor of Medicine.
B.Mus.— Bachelor of Music.
Bot.— Botany.
Bp.— Bishop.
B.Ph.— Bachelor of Philosophy.
Br.— Brig; British; Brother.
Brig.— Brigade; Brigadier.
Brig.-Gen.— Brigadier-General.
Brit. Mus.— British Museum.
Bro.— Brother.
B.S. or B.Sc.— Bachelor in the Sciences.
Bt.— Baronet.
B.V.— *Beata Virgo*, Blessed Virgin; *Bene vale*, farewell.
C.— *Caput* or *capitulum*, chapter; Celsius; Cent; Centigrade; Cents; *Centum*, a hundred; Century; *Circa* or *circiter*, about; Consul.
C.A.— Chief Accountant; Commissioner of Accounts.
Cam., Camb.— Cambridge.
Can.— Canon.
Cant.— Canticles.
Cantab.— *Cantabrigiæ*, *Cantabrigiensis*, or Cambridge. In music *cantabile*, singing tone.
Cantuar.— *Cantuariæ*, *Cantuariensis*, of Canterbury.
Cap.— *Caput*, *capitulum*, chapter.
Capt.— Captain.
Capt.-Gen.— Captain-General.
Card.— Cardinal.
Cath.— Catherine, Catholic, Cathedral.
C.B.— Cape Breton; *Communis Bancus*, Common Bench; Companion of the Bath.
C.C.— Caius College; *Compte courante*, account current; Circuit Court; County Commissioner; County Court; Cubic centimeter.
C.E.— Civil Engineer; Church of England; Christian Endeavor Society.
Celt.— Celtic.
Cent.— Centigrade, a scale of 100° from freezing to boiling; Central; *Centum*, a hundred; Century.
Cf.—*Confer*, compare.
C.G.— Commissary-General; Consul-General.
C.G.H.—Cape of Good Hope.
Chap.— Chapter.
Ch.J.— Chief Justice.
Chr.— Christ; Christian; Christopher.
Chron.— Chronicles.
Cic.— Cicero.
Circ.— *Circa*, or *circiter*, about; Circuit.
Cit.— Citation; Cited; Citizen.
Civ.— Civil.
C.J.— Chief Justice.
C.M.G.— Companion of the Order of St. Michael and St. George.
Co.— Company; county.
c/o.— In care of.
Coch., or Cochl.— *Cochlear*, a spoonful. *C. amp.* (*amplum*), a tablespoonful. *C. mag.* (*magnum*), a large spoonful. *C. med.* (*medium*), a dessert-spoonful. *C. parv.* (*parvum*), a small spoonful or teaspoonful.

C.O.D.— Cash (or collect) on delivery.
Coll.— College.
Com.— Commerce; Committee; Commissioner; Commodore.
Com. Ver.— Common Version (of the Bible).
Con.— *Contra,* against; in opposition.
Conch.— Conchology.
Confed.— Confederate.
Cong.— Congress.
Congl.— Congregational.
Conj.— Conjunction.
Copt.— Coptic.
Cor.— Corinthians.
Cor. Mem.— Corresponding Member.
Corn.— Cornwall; Cornish.
Cor. Sec.— Corresponding Secretary.
Coss.— *Consules,* Consuls.
Cp.— Compare.
C.P.A.— Certified Public Accountant.
C.P.S.— *Custos Privati Sigilli,* Keeper of the Privy Seal.
Cr.— Credit; Creditor.
Crim. Con.— Criminal conversation (adultery).
C.S.— Court of Sessions; *Custos Sigilli,* Keeper of the Seal.
C.S.A.— Confederate States of America; Confederate States Army.
C.S.I.— Companion of the Order of the Star of India.
C.S.N.— Confederate States Navy.
C.Theod.— *Codice Theodosiano,* in the Theodosian Code.
Cwt.— Hundred weight.
Cyc.— Cyclopedia.
d.— *Denarius,* penny, pence; Died.
D.C.— *Da capo,* from the beginning; District of Columbia.
D.C.L.— Doctor of Civil Law.
D.D.— *Divinitatis Doctor,* Doctor of Divinity.
D.D.S.— Doctor of Dental Surgery.
Dea.— Deacon.
Dec.— December; Declination.
Dec. of Ind.— Declaration of Independence.
Def.— Defendant.
Deg.— Degree; degrees.
Dem.— Democrat; Democratic.
Dep.— Deputy.
Deut.— Deuteronomy.
D.F.— Defender of the Faith.
D.G.— *Dei gratia,* by the grace of God; *Deo gratias,* thanks to God.
Disc.— Discount.
Dist.—District.
D.M.— Doctor of Music.
D.M.D.— Doctor of Medical Dentistry.
D.O.— Doctor of Osteopathy.
Do.— *Ditto,* the same.
Doc.— Document.
D.O.M.— *Deo optimo maximo,* to God, the best, the greatest.
D.O.S.— Doctor of Orthopedic Surgery.
D.P. or D.Ph.— Doctor of Philosophy.
Dpt.— Department.
Dr.— Debtor; Doctor.
D.Sc.— Doctor of Science.
D.T.— *Doctor Theologiæ,* Doctor of Theology.
D.V.— *Deo volente,* God willing.
D.V.M.— Doctor of Veterinary Medicine.
Dwt.— Pennyweight.
Dyn.— Dynamics.
E.— East.
Ebor.— *Eboracum,* York.
Eccl.— Ecclesiastes.
Ecclus.— Ecclesiasticus.
Ed.— Editor; Edition.
Edin.— Edinburgh.
E.E.— Electrical Engineer.
e. g.— *Exempli gratia,* for example; *Ex grege,* among the rest.
E. I.— East Indies or East India.
E. Lon.— East longitude.
E.M.— Mining Engineer.
Encyc.— Encyclopedia.
Encyc. Amer.— Encyclopedia Americana.
Eng.— Engineering; Engineers; England; English.
Env. Ext.— Envoy Extraordinary.
Ep.— Epistle.
Epis.— Episcopal.
Esq.— Esquire.
Et al.— *Et alii,* and others.
Etc., or &c.— *Et cæteri, et cæteræ, et cætera,* and others; and so forth.
Et seq.— *Et sequentes, et sequentia,* and what follows.
Etym.— Etymological; Etymology.
E.U.— *Etats Unis,* United States; Evangelical Union.
Ex.— Example; Exodus.
Exch.— Exchange.
Exec.— Executive; Executor.
Execx.— Executrix.
Exon.— *Exonia,* Exeter; *Exoniæ, Exoniensis,* of Exeter.
Ex p.— *Ex parte,* in behalf of.
F.— Fahrenheit; Franc; Francs.
Fahr.— Fahrenheit.
F. and A.M.— Free and Accepted Masons.
F.A.S.— Fellow of the Antiquarian Society.
F.B.S.— Fellow of the Botanical Society.
Fcap. or fcp.— Foolscap.
F.C.P.S.— Fellow of the Cambridge Philological Society.
F.C.S.— Fellow of the Chemical Society.
F.D.— *Fidei Defensor,* Defender of the Faith.
Fec.— *Fecit,* he did or made it.
Fed.— Federal.
F.E.S.— Fellow of the Entomological Society; Fellow of the Ethnographical Society.
Ff.— *Fecerunt,* they did or made it; Folios; Following; Fortissimo.
F.G.S.— Fellow of the Geological Society.
F.H.S.— Fellow of the Horticultural Society.
Fid. Def.— *Fidei Defensor,* Defender of the Faith.
Fig.— Figure.
Fin.— Finland.
Finn.— Finnish.
Fir.— Firkin.
Fl.— Florin; Florins; Flourished.
F.L.S.— Fellow of the Linnæan Society.
F.-M.— Field-Marshal.
F. o. b.— Free on board.
Fol.— Folio.
For.— Foreign.
F.P.S.— Fellow of the Philological Society.
Fr.— *Fragmentum,* fragment; Franc; France; Francis; Francs; French.
F.R.A.S.— Fellow of the Royal Asiatic Society; Fellow of the Royal Astronomical Society.
F.R.C.P.— Fellow of the Royal College of Physicians.
F.R.C.S. (E.I. or L.).— Fellow of the Royal College of Surgeons (Edinburgh, Ireland, or London).

F.R.G.S.— Fellow of the Royal Geographical Society.
F.R. Hist. Soc.— Fellow of the Royal Historical Society.
F.R.S.— Fellow of the Royal Society.
F.R.S.E.— Fellow of the Royal Society, Edinburgh.
F.R.S.L.— Fellow of the Royal Society, London.
F.R.S.S.A.— Fellow of the Royal Scottish Society of Arts.
F.R.Z.S.— Fellow of the Royal Zoological Society.
F.S.A.— Fellow of the Society of Arts, or of Antiquaries.
F.S.A.E.— Fellow of the Society of Antiquaries, Edinburgh.
F.S.A. Scot.— Fellow of the Society of Antiquaries of Scotland.
F.S.S.— Fellow of the Statistical Society.
Ft.— Foot; feet; Fort.
Fur.— Furlong.
F.Z.S.— Fellow of the Zoological Society.
G.— Guineas.
G.A.R.— Grand Army of the Republic.
G. B.— Great Britain.
G. B. & I.— Great Britain and Ireland.
G.C.B.— Grand Cross of the Bath.
G.C.H.— Grand Cross of Hanover.
G.C.K.P.— Grand Commander of the Knights of St. Patrick.
G.C.L.H.— Grand Cross of the Legion of Honor.
G.C.M.G.— Grand Cross of St. Michael and St. George.
G.C.S.I.— Grand Commander of the Star of India.
Gen.— Genealogy; Genera; General; Genesis; Genus.
Gl., or Gloss.— Glossary.
G.L.—Grand Lodge.
G.M.— Grand Master.
G.M.K.P.— Grand Master of the Knights of St. Patrick.
G.M.S.I.— Grand Master of the Star of India.
G.O.— General Order.
Goth.— Gothic.
G.P.O.— General Post-Office.
Gr.— Greek.
G. R.— *Georgius Rex*, King George.
Gr., Grs.— Grain; Grains.
G.S.— Grand Secretary; Grand Sentinel; Grand Scribe.
Gtt.— *Gutta* or *guttæ*, drop; drops.
H.— Hour.
Hab.— Habakkuk.
Hab. corp.— *Habeas corpus*, that you have the body.
Hab. fa. poss.— *Habere facias possessionem*, that you cause to have possession,— a legal writ.
Hab. fa. seis.— *Habere facias seisinam*, that you cause to have seisin,— a legal writ.
H.B.M.— His or Her Britannic Majesty.
H.M.S.— His (or Her) Majesty's Ship.
H.C.M.— His or Her Catholic Majesty.
H.E.— His Excellency, or His Eminence.
Heb.— Hebrew; Hebrews.
Her.— Heraldry.
H.H.— His or Her Highness; His Holiness (the Pope).
H. I.— Hawaiian Islands.
Hier.— *Hierosolyma*, Jerusalem.
H.I.H.—His or Her Imperial Highness.
Hind.— Hindu; Hindustan; Hindustani.
H.J.S.— *Hic jacet sepultus*, here lies buried.
H.L.— House of Lords.
H.M.— His or Her Majesty.
H.M.P.— *Hoc monumentum posuit*, erected this monument.
H.M.S.—His or Her Majesty's Ship or Service.
Hon.— Honorable.
Hort.— Horticulture.
Hos.— Hosea.
H.R.— House of Representatives.
H.R.H.— His or Her Royal Highness.
H.R.I.P.— *Hic requiescit in pace*, Here rests in peace.
H.S.— *Hic situs*, Here lies.
H.S.H.— His or Her Serene Highness.
Hypoth.— Hypothesis; Hypothetical.
I.— *Imperator* or *Imperatrix*, Emperor or Empress.
Ib., or ibid.— *Ibidem*, in the same place.
Ich., or Ichth.— Ichthyology.
Icon. Encyc.— Iconographic Encyclopedia.
I. Ch. Th. U. S.—Ἰ(ησοῦ)Χ(ριστὸς) Θ(εοῦ) Υ(ἱὸς) Σ(ωτὴρ) (*Iesous Christos, Theou Uios, Soter*), Jesus Christ, the Son of God, the Saviour; also written Ἰχθύς = a fish; whence the symbol of a fish for the sacred name.
Id.— *Idem*, the same.
i.e.— *Id est*, that is.
I.H.S.— (Corrupted from Gr. ΙΗΣ, abbrev. of ΙΗΣΟΥΣ, Jesus). Now read *Jesus Hominum Salvator*, Jesus the Saviour of Men.
Imp.— Imperative; *Imperator*, emperor; Imperial.
In.— Inch; inches.
Inc. or Incor.— Incorporated.
Incog.— *Incognito*, unknown.
I.H.P.— Indicated horse-power.
I.N.D.— *In nomine Dei*, in the name of God.
Inf.— *Infra*, beneath, or below.
In f.— *In fine*, at the end.
In lim.— *In limine*, at the outset.
In loc.— *In loco*, in the place.
In pr.— *In principio*, in the beginning.
I.N.R.I.— *Jesus Nazarenus, Rex Judæorum*, Jesus of Nazareth, King of the Jews.
Inst.— Instant; Institute; Institutes; Institution.
In trans.— *In transitu*, in transit.
Int. Rev.— Internal Revenue.
Ion.— Ionic.
I.O.O.F.— Independent Order of Odd Fellows.
I.O.S.M.— Independent Order of the Sons of Malta.
I.O.U.— I owe you.
Ipecac.— Ipecacuanha.
I.R.— Imperator, Rex.
Ital.— Italic; Italian.
J.— Justice, or Judge.
J.A.— Judge-Advocate.
J.C.— *Jurisconsultus*, jurisconsult.
J.C.D.— *Juris Civilis Doctor*, Doctor of Civil Law.
J.D.— *Juris Doctor*, Doctor of Law.
J.P.— Justice of the Peace.
J. Prob.— Judge of Probate.
Jud.— Judicial; Judith.
J.U.D., or J.V.D.— *Juris utriusque Doctor*, Doctor of both laws (of the Canon and the Civil Law).
Judge-Adv.— Judge-Advocate.
K.— Karat; Karats; King.
K.A.— Knight of St. Andrew, in Russia.

Kal.— *Kalendæ*, the Kalends.
K.B.— King's Bench; Knight of the Bath.
K.B.A.—Knight of St. Bento d'Avis, in Portugal.
K.B.E.— Knight of the Black Eagle, in Russia.
K.C.— King's Counsel; Knight of the Crescent, in Turkey.
K.C.B.— Knight Commander of the Bath.
K.C.H.— Knight Commander of Hanover.
K.C.S.— Knight of Charles III of Spain.
K.E.— Knight of the Elephant, in Denmark.
K.F.— Knight of Ferdinand, in Spain.
K.F.M.— Knight of St. Ferdinand and Merit, in Sicily.
K.G.— Knight of the Garter.
K.G.C.— Knight of the Golden Circle; Knight of the Grand Cross.
K.G.C.B.— Knight of the Grand Cross of the Bath.
K.G.F.— Knight of the Golden Fleece, in Spain.
K.G.H.— Knight of the Guelphs of Hanover.
K.G.V.— Knight of Gustavus Vasa, in Sweden.
K.H.— Knight of Hanover.
Kilo., Kilog.— Kilogram.
Kilo., Kilom.— Kilometer.
K.L.— Knights of Labor.
K.L., or K.L.A.— Knight of Leopold of Austria.
K.L.H.— Knight of the Legion of Honor.
K.M.— Knight of Malta.
K.M.H.— Knight of Merit of Holstein.
K.M.J.— Knight of Maximilian Joseph, in Bavaria.
K.M.T.— Knight of Maria Theresa, in Austria.
K.N.S.— Knight of the North Star, in Sweden.
Knt. or Kt.— Knight.
K.P.— Knight of St. Patrick; Knight of Pythias.
K.R.C.— Knight of the Red Cross.
K.R.E.— Knight of the Red Eagle, in Prussia.
K.S.— Knight of the Sword, in Sweden.
K.S.A.— Knight of St. Anne, in Russia.
K.S.E.— Knight of St. Esprit, in France.
K.S.F.— Knight of St. Fernando, in Spain.
K.S.F.M.— Knight of St. Ferdinand and Merit, in Naples.
K.S.G.— Knight of St. George, in Russia.
K.S.H.— Knight of St. Hubert, in Bavaria.
K.S.J.— Knight of St. Januarius, in Naples.
K.S.L.— Knight of the Sun and Lion, in Persia.
K.S.M. & S.G.— Knight of St. Michael and St. George, in the Ionian Islands.
K.S.P.— Knight of St. Stanislaus of Poland.
K.S.S.— Knight of the Southern Star, in Brazil; Knight of the Sword of Sweden.
K.S.V.— Knight of St. Vladimir, in Russia.
Kt.— Knight.
K.T.— Knight of the Thistle; Knight Templar.
K.t.l. (Gr:K.τ.λ)— *Και τα λειπομενα* (*kai ta leipomena*), or *λοιπα* (*loipa*), and so forth; and the rest; same as "etc."
K.T.S.— Knight of the Tower and Sword, in Portugal.
K.W.— Knight of William, in the Netherlands.
K.W.E.— Knight of the White Eagle, in Poland.
L.— Lake; *Liber*, book; *Libra, libræ*, pound, pounds.
L.A.C.— Licentiate of the Apothecaries' Company.
Lapp.— Lappish.
Lat.— Latitude.
Lb., or lbs.— *Libra* or *libræ*, pound or pounds in weight.
L.C.— *Loco citato*, in the place cited; Lord Chamberlain; Lord Chancellor; Lower Canada; Lower case.
Leg.— Legal; Legate.
Legis.— Legislature.
Lev.— Leviticus.
Lex.— Lexicon.
L.H.A.— Lord High Admiral.
L.H.C.— Lord High Chancellor.
L.H.D.— *Litterarum Humaniorum Doctor*, Doctor of the More Humane Letters.
L.H.T.— Lord High Treasurer.
Lib.— *Liber*, book.
Lieut.-Col.— Lieutenant-Colonel.
Lieut.-Gen.— Lieutenant-General.
Lieut.-Gov.— Lieutenant-Governor.
Linn.— Linnæus; Linnæan.
Liq.— Liquid; Liquidation; Liquor.
Lit.— Literally; Literature.
Lith.— Lithuanian.
Litt.B.— Bachelor of Letters.
Litt.D.— Doctor of Letters.
L.L.— *Loco laudato*, in the place praised (quoted); Lord Lieutenant.
L.Lat.— Low Latin; Law Latin.
LL.B.— *Legum Baccalaureus*, Bachelor of Laws.
LL.D.— *Legum Doctor*, Doctor of Laws.
LL.M.— *Legum Magister*, Master of Laws.
L.M.S.— London Missionary Society.
Loc. cit.— *Loco citato*, in the place cited.
Long.— Longitude.
L.R.C.P.— Licentiate of the Royal College of Physicians.
L.R.C.S.— Licentiate of the Royal College of Surgeons.
L.S.— *Locus sigilli*, place of the seal.
L.S.A.— Licentiate of the Society of Apothecaries.
L.S.D.— Pounds, shillings, and pence.
LXX.— The Septuagint (Version of the Old Testament).
M.— Married; *Meridies*, noon; Mile; *Mille*, a thousand; Minute, minutes; *Monsieur*, mister.
M.A.— Master of Arts.
M. Am. Soc. C.E.— Member American Society Civil Engineers.
Maj.-Gen.— Major-General
Math.— Mathematics; Mathematician.
M.B.— *Medicinæ Baccalaureus*, Bachelor of Medicine; *Musicæ Baccalaureus*, Bachelor of Music.
M.B.F. et H.— *Magna Britannia, Francia, et Hibernia*, Great Britain, France, and Ireland.
M.C.— Member of Congress; Master of Ceremonies; Master Commandant.
M.C.E.— Master of Civil Engineering.
Mch.— March.
M.D.— *Medicinæ Doctor*, Doctor of Medicine.
Mdlle.—Mademoiselle.
Mdse.— Merchandise.
M.E.— Methodist Episcopal; Military or Mechanical Engineer.
Mech.— Mechanic; Mechanical.
M.E.G.H.P.— Most Excellent Grand High Priest.
Mem.— *Memento*, remember; Memorandum.
M.E.S.— Methodist Episcopal, South.
Metal.— Metallurgy.
Meteor.— Meteorology.
Meth.— Methodist.
Mex.— Mexico, or Mexican.
M.F.A.— Minister of Foreign Affairs; Master of the Fox Hounds (Eng.).
M. Goth.— Mœso-Gothic.

Mic.— Micah.
M.I.C.E.— Member of the Institution of Civil Engineers.
Mich.—Michael; Michaelmas.
Mil.— Military.
Min.— Mineralogy; Mining; Minute, minutes.
M.L.— Master of Laws.
M.L.A.— Mercantile Library Association; Member of the Legislative Assembly (S. Africa).
Mlle.— Mademoiselle.
MM.— *Messieurs,* Gentlemen; (Their) Majesties.
M.M.E.— Master of Mining Engineering.
Mme.— *Madame,* Madam.
M.M.S.— Moravian Missionary Society.
M.M.S.S.— *Massachusettensis Medicinæ Societatis Socius,* Fellow of the Massachusetts Medical Society.
M.N.A.S.— Member of the National Academy of Sciences.
M.P.— Member of Parliament; Metropolitan Police; Methodist Protestant.
M.P.P.— Member of Provincial Parliament.
M.P.S.— Member of the Philological Society; Member of the Pharmaceutical Society.
M.R.A.S.— Member of the Royal Asiatic Society; Member of the Royal Academy of Science.
M.R.C.C.— Member of the Royal College of Chemistry.
M.R.C.P.— Member of the Royal College of Physicians.
M.R.C.S.— Member of the Royal College of Surgeons.
M.R.C.V.S.— Member of the Royal College of Veterinary Surgeons.
M.R.G.S.— Member of the Royal Geographical Society.
M.R.I.— Member of the Royal Institution.
M.R.I.A.— Member of the Royal Irish Academy.
M.R.S.L.— Member of the Royal Society of Literature.
M.S.— Master of Science; *Memoriæ sacrum,* sacred to the memory.
M.S.A.— Master of Science in Agriculture.
Mus.B.— *Musicæ Baccalaureus,* Bachelor of Music.
Mus.D.— *Musicæ Doctor,* Doctor of Music.
M.W.G.C.P.— Most Worthy Grand Chief Patriarch.
M.W.G.M.— Most Worthy Grand Master; Most Worshipful Grand Master.
Myth.— Mythology.
N.— Neuter; North; Note; Noun; Number.
N.A.— National Academician; North America; North American.
N.A.S.— National Academy of Sciences.
Nat.— Natural; National.
Nath.— Nathanael, or Nathaniel.
Naut.— Nautical.
Naut. Alm.— Nautical Almanac.
N.B.— New Brunswick; North Britain (i.e. Scotland); North British (i.e. Scottish); *Nota bene,* mark well; take notice.
N.D.— No date; Not dated; North Dakota.
Neh.— Nehemiah.
N. e. i.— *Non est inventus,* he is not found.
Nem. con., or nem. diss.— *Nemine contradicente,* or *nemine dissentiente,* no one opposing or dissenting; unanimously.
N. l.—*Non liquet,* it does not appear.
N. lat.— North latitude.
N.M.— New measurement; New Mexico.
Nol. pros.— *Nolle prosequi,* unwilling to proceed.
Non-com.— Non-commissioned (officer).
Non cul.— *Non culpabilis,* not guilty.
Non obst.— *Non obstante,* notwithstanding.
Non pros.— *Non prosequitur,* he does not prosecute.
Non seq.— *Non sequitur,* it does not follow.
Notts.— Nottinghamshire.
N.P.— *Nisi Prius;* Notary Public.
N.P.D.— North Polar Distance.
N.S.— New Series; New Style (after 1752); Novia Scotia.
N.S.J.C.— *Noster Salvator Jesus Christus,* Our Savious Jesus Christ.
N.S.W.— New South Wales.
Num.— Numbers (Book of).
N.V.— New Version.
N.Z.— New Zealand.
Ob.— *Obiit,* he or she died.
Obs.— Obsolete; Observatory; Observation.
Oct., or 8vo.— Octavo.
O.F.— Odd Fellow, or Odd Fellows.
O.G.— Outside Guardian.
O.H.M.S.— On His or Her Majesty's Service.
Olym.— Olympiad.
O.M.— Old Measurement; Order of Merit.
Opt.— Optics.
O.S.— Old Series; Old Style; Outside Sentinel.
O.U.A.— Order of United Americans.
Oxon.— *Oxonia,* Oxford; *Oxoniæ, Oxoniensis,* of Oxford.
Oz.— *Onza,* ounce.
P.— Page; Part; Particle; *Pondere,* by weight.
Pal.— Palæontology.
Parl.— Parliament.
Pathol.— Pathology.
Paym.-Gen.— Paymaster-General.
P.B.— *Philosophiæ Baccalaureus,* Bachelor of Philosophy; Primitive Baptist.
P.C.— *Patres Conscripti,* Conscript Fathers, Senators; Postal card; Privy Council; Privy Councilor.
P.C.P.— Past Chief Patriarch.
P.C.S.— Principal Clerk of Sessions.
Pd.— Paid.
P.D.— *Philosophiæ Doctor,* Doctor of Philosophy.
P.E.— Protestant Episcopal
P.E.I.— Prince Edward Island.
Per.— Persia; Persian.
Per ann.— *Per annum,* by the year.
Per cent.— *Per centum,* by the hundred.
Peri.— Perigee.
Per proc.— *Per procurationem,* by procuration, or by power of attorney.
Phar.— Pharmacy.
Ph.B.— *Philosophiæ Baccalaureus,* Bachelor of Philosophy.
Ph.D.— *Philosophiæ Doctor,* Doctor of Philosophy.
Ph.G.— Graduate in Pharmacy.
Phil.— Philadelphia; Philemon; Philip; Philippians; Philosophical; Philosophy.
Philem.— Philemon.
Philomath.— *Philomathes,* a lover of learning
Phren.— Phrenology.
P.I.— Phillipine Islands.
Pinx, or pxt.—*Pinxit,* he (she) painted it.
P.M.— Passed Midshipman; *Post meridiem,* afternoon, evening; Postmaster; Past Master.
P.M.G.— Postmaster-General.
P.O.— Post Office; Province of Ontario.
P. of H.— Patrons of Husbandry.

P.-O.O.— Post-Office order.
PP.— *Patres,* Fathers.
P.P.— Parish priest; *Per procurationem,* by procuration, or by power of attorney.
P.P.C.— *Pour prendre congé,* to take leave.
P.Q.— Previous Question; Province of Quebec.
Pr.— *Per,* by, or by the.
P.R.— *Populus Romanus,* the Roman people; Porto Rico.
P.R.A.— President of the Royal Academy.
P.R.C.— *Post Romanum conditum,* from the building of Rome.
Presb.— Presbyterian.
Pro tem.— *Pro tempore,* for the time being.
Prov.— Proverbs; Province; Provost.
Prox.— *Proximo,* next (month).
P.R.S.— President of the Royal Society.
Prus.— Prussia; Prussian.
Ps.—Psalm, or Psalms.
P.S.— *Post scriptum,* postscript; Privy Seal.
Psych.— Psychic; Psychical; Psychology.
Pt.— Part; Pint; Payment; Point; Port.
P.T.O.— Please turn over.
P.W.P.— Past Worthy Patriarch.
Pwt.— Pennyweight; pennyweights.
Q.— *Quadrigans,* farthing; *Quasi,* as it were, almost; Queen; Query, or question.
Q.B.— Queen's Bench.
Q.C.—Queen's College; Queen's Counsel.
Q. d.— *Quasi dicat,* as if he should say; *quasi dictum,* as if said; *quasi dixisset,* as if he had said.
Q. e.— *Quod est,* which is.
Q. e. d.— *Quod erat demonstrandum,* which was to be proved.
Q. e. f.— *Quod erat faciendum,* which was to be done.
Q. e. i.— *Quod erat inveniendum,* which was to be found out.
Q. l.— *Quantum libet,* as much as you please.
Qm.— *Quomodo,* how; by what means.
Q.M.G.— Quartermaster-General.
Q. p., or q. pl.— *Quantum placet,* as much as you please.
Q.S.— *Quantum sufficit,* as much as may suffice; Quarter Sessions.
Qt.— Quart.
Qu., or qy.— *Quære,* inquire; query.
Quad.— Quadrant; Quadrate.
Q. v.— *Quo'd vide,* which see; *Quantum vis,* as much as you will.
R.— Railroad; Railway; *Recipe,* take; *Regina,* Queen; River.
R.A.— Royal Academician; Royal Academy; Royal Arch; Royal Artillery.
RC.— *Rescriptum,* a counterpart.
R.C.— Roman Catholic.
R.C.S.— Royal College of Surgeons.
R.C.P.— Royal College of Physicians.
R.D.— Rural Dean.
R.E.— Reformed Episcopal; Royal Engineers.
Rec.— Recipe; Record; Recorder; Recording.
Recd.— Received.
Rect.— Rector; Receipt.
Ref.— Reformed; Reformation; Reference.
Reg.— Regiment; Register; Registrar; Regular.
Reg. Prof.— *Regius Professor,* Royal Professor.
Rev.—Reverend; Revelation (Book of); Review; Revenue; Revise.
R.H.S.— Royal Humane Society; Royal Historical Society.
R.I.P.— *Requiescat in pace,* Let him (her) rest in peace.
R.M.— Royal Marines; Royal Mail.
R.M.S.— Railway Mail Service; Royal Mail Service; Royal Mail Steamer.
R.N.— Royal Navy.
R.N.R.— Royal Naval Reserve.
Rom.— Roman; Romans.
R.P.— Reformed Presbyterian; *Regius Professor,* Royal Professor.
R.S.A.— Royal Society of Antiquaries; Royal Scottish Academy.
R.S.V.P.— *Répondez, s'il vous plaît,* answer, if you please.
Rt. Hon.— Right Honorable.
Rt. Rev.— Right Reverend.
R.T.S.— Religious Tract Society.
Rt. Wpful.— Right Worshipful.
R.U.E.— Right upper entrance.
R.V.— Revised Version.
R.W.D.G.M.— Right Worshipful Deputy Grand Master.
R.W.G.R.— Right Worthy. Grand Representative.
R.W.G.S.— Right Worthy Grand Secretary.
R.W.G.T.— Right Worthy Grand Treasurer; Right Worshipful Grand Templar.
R.W.G.W.— Right Worthy Grand Warden.
R.W.S.G.W.— Right Worshipful Senior Grand Warden.
Rx.— Rupees.
S.— Saint; Scribe; Second; Series; *Solidus,* a shilling; South; Sun; Sunday.
S.A.— *Secundum artem,* according to art; South America; South Australia.
S.A.S.— *Societatis Antiquariorum Socius,* Fellow of the Society of Antiquaries.
S.C.— *Senatus Consultum,* a decree of the Senate; Small capitals; South Carolina; Staff Corps; Supreme Court.
Sc.— Scene; *Scilicet,* namely, to wit; Scruple; *Sculpsit,* he (or she) engraved it.
Scan. Mag.— *Scandalum magnatum,* scandal of the great.
Scapa (S.C.A.P.A.).— Society for Checking Abuses in Public Advertising.
Sc. B.— *Scientiæ Baccalaureus,* Bachelor of Science.
Schol.— *Scholium,* a note.
Scr.— Scruple.
Scrip.— Scripture.
Sculp.— *Sculpsit,* he (or she) engraved it
S.D.U.K.— Society for the Diffusion of Useful Knowledge.
Sec.— Secretary; Second; Section.
Sec. Leg.— Secretary of Legation; *Secundum legem,* according to law.
Sec. Reg.— *Secundum regulam,* according to rule.
Sem.— *Semble,* it seems; Seminary.
Seq.— *Sequentia,* following; *Sequitur,* it follows.
Serg.-Maj.— Sergeant-Major.
Sess.— Session.
S.-G.— Solicitor-General.
S.H.S.—*Societatis Historiæ Socius,* Fellow of the Historical Society.
S.I.M.— Society for Increase of the Ministry.
S.J.— Society of Jesus; a Jesuit.
S.M.— State Militia; Short Meter; Sergeant-Major; Sons of Malta.
S.M. Lond. Soc.— *Societatis Medicæ Londonensis Socius,* Member of the London Medical Society.
Soc. Isl.— Society Islands.
Sol.-Gen.— Solicitor-General.
S.P.— *Sine prole,* without issue.

S.P.A.S.—*Societatis Philosophicæ Americanæ Socius*, Member of the American Philosophical Society.
S.P.C.A.—Society for the Prevention of Cruelty to Animals.
S.P.C.C.—Society for the Prevention of Cruelty to Children.
S.P.C.K.—Society for the Promotion of Christian Knowledge.
S.P.G.—Society for the Propagation of the Gospel.
Sp. gr.—Specific gravity.
S.P.M.—Short particular metre.
S.P.Q.R.—*Senatus Populusque Romanus*, the Senate and people of Rome.
S.P.R.L.—Society for the Promotion of Religion and Learning.
Sq.—*Sequens*, following; usually *et seq.*, and following (pages); Square.
Sqq.—*Sequentibus*, the following (pages or places).
S.R.I.—*Sacrum Romanum Imperium*, Holy Roman Empire.
S.R.S.—*Societatis Regiæ Socius*, Fellow of the Royal Society.
SS.—Saints; *Scilicet*, to wit; *Semis*, half; Sessions.
S.S.—Steamship; Sunday-school.
S.S.E.—South-southeast.
S.S.W.—South-southwest.
St.—Saint; Street.
S.T.B.—*Sacræ Theologiæ Baccalaureus*, Bachelor of Sacred Theology.
S.T.D.—*Sacræ Theologiæ Doctor*, Doctor of Sacred Theology.
Ster., or Stg.—Sterling.
S.T.P.—*Sacræ Theologiæ Professor*, Professor of Sacred Theology.
Su.-Goth.—Suio-Gothic.
Sup.—Superfine; Supplement; *Supra*, above; Supreme.
Surg.—Surgeon; Surgery.
Surg.-Gen.—Surgeon-General.
S.V.—*Sub voce*, under the word or title.
Syn.—Synonym; Synonymous.
Syr.—Syriac.
Tan.—Tangent.
T.E.—Topographical Engineers.
Tel.—Telegraph or Telephone.
Text. Rec.—*Textus Receptus*, Received Text.
Thess.—Thessalonians.
Tob.—Tobit.
Tom.—*Tome*, volume.
Topog.—Topography; Topographical.
Tr.—Transpose; Translator; Translation; Trustee.
Trans.—Translator; Translation; Transactions; Transpose.
Tur.—Turkey.
Typ.—Typical; Typographer; Typographical.
U.—Union.
U.B.—United Brethren.
U.C.—Upper Canada; *Urbe condita*, year of the founding of Rome.
U.J.D.—*Utriusque Juris Doctor*, Doctor of both Laws (Canon and Civil).
U.K.—United Kingdom.
U.K.A.—Ulster King-at-Arms; United Kingdom Alliance.
Ult.—*Ultimo*, last; of the last month.
U.P.—United Presbyterian.
U.S.—United States.
U.S.A.—United States of America; United States Army.
U.S.M.—United States Mail; United States Marines.
U.S.M.A.—United States Military Academy.
U.S.M.C.—United States Marine Corps.
U.S.M.H.S.—United States Marine Hospital Service.
U.S.N.—United States Navy.
U.S.N.A.—United States Naval Academy.
U.S.S.—United States Senate; United States Ship.
U.s.w.—*Und so weiter*, and so further; same as "etc."
V.—*Versus*, against; *Versiculo*, in such a verse; *Vide*, see.
Val.—Valorem; Value.
Vat.—Vatican.
V.C.—Victoria Cross; Vice-Chairman; Vice-Chancellor.
V.D.M.—*Verbi Dei Minister*, Minister of God's word.
V.G.—Vicar-General.
V.g.—*Verbi gratia*, as for example.
Vid.—*Vide*, see.
Visc.—Viscount.
Viz., or vl.—*Videlicet*, to wit; namely; that is to say.
Vo.—*Verso*, left-hand page.
Vols.—Volunteers; Volumes.
V.P.—Vice-President.
V.R.—*Victoria Regina*, Queen Victoria.
Vs.—*Versus*, against; *Versiculo*, in such a verse.
V.S.—Veterinary Surgeon.
Vul.—Vulgate.
W.B.M.—Woman's Board of Missions.
W.C.A.—Woman's Christian Association.
W.C.T.U.—Women's Christian Temperance Union.
W.F.—Wrong font.
W.F.M.S.—Woman's Foreign Missionary Society.
W.H.M.A.—Woman's Home Missionary Asciation.
W.M.—Worshipful Master.
W.M.S.—Wesleyan Missionary Society.
W.N.C.T.U.—Woman's National Christian Temperance Union.
W.S.—Writer to the Signet.
X., or Xt.—Christ. (X in this and the following abbreviations is the Greek *chi*.)
Xmas., or Xm.—Christmas.
Xn., or Xtian.—Christian.
Xnty., or Xty.—Christianity.
Xper., or Xr.—Christopher.
Y.M.C.A.—Young Men's Christian Association.
Y.M.C.U.—Young Men's Christian Union.
Y.P.S.C.E.—Young People's Society of Christian Endeavor.
Y.W.C.A.—Young Women's Christian Association.
Zach.—Zachary.
Zech.—Zechariah.
Zeph.—Zephaniah.

ABBREVIATORS, a body of 72 writers in the Papal Chancery who have charge of sketching and putting in shape papal bulls, briefs, and consistorial decrees, and signing them in the name of the Cardinal Vice-Chancellor. This body receives its name from the fact of their taking short-hand notes of the decisions to be later expanded. They have existed at least since 1400.

A B C CLUB (ā-bā-sā'): a name adopted by certain republican enthusiasts in Paris, professing to relieve the depressed — *abaissés*. Their insurrection of 5 June 1832 was suppressed with bloodshed. The event is described in Victor Hugo's 'Les Misérables' (1862).

"A. B. C. POWERS," a convenient and popular designation applied to Argentina, Brazil, and Chile, the three strong nations of South America united to a certain extent by treaty in 1915, after having been, in 1914, associated very conspicuously and honorably as mediators actively concerned in efforts to arrange a peaceful settlement of the quarrel between the administration of the United States and General Huerta of Mexico. The growth of the movement which culminated in the treaty of 1915 is marked by .three distinct phases in the course of a decade. Thus, during the early months of 1906 there was frank talk of the imminence of war between Chile and Argentina, but at the same time publicists in Buenos Aires advocated a permanent agreement which should remove onerous taxes at the Brazilian and Chilean frontiers and justify the reduction of armaments — an idea essentially right, yet requiring for popular acceptance some authoritative foreign approbation to overcome deep-seated, inveterate local prejudices or aversions. Such was the first phase. The entirely reasonable advocacy of a South American triple entente therefore made little headway until the administration at Washington had entangled its policies in the complications of hostile Mexican factions. The "A. B. C." nations then saw their opportunity to stand out together before the world, side-by-side, in a most distinguished fashion. They proposed mediation four days after the United States had inaugurated hostilities at Vera Cruz. The acceptance of their offer and the proceedings of the Niagara Falls conference gave prominence to the second phase (see LATIN AMERICA — RECENT HISTORY). Then events moved swiftly toward the consummation long desired by leaders of thought in Buenos Aires and advocated, as we have said, for 10 years, more or less. On 25 May 1915 a treaty of peace, valid for five years, was signed at Buenos Aires by representatives of Argentina, Brazil, and Chile — the first actual treaty between these separatists and therefore jealously competing nations — by the terms of which each was pledged not to make war against either of the others before investigation, etc., of the causes of conflict by an impartial commission. This marks the third, or present, phase.

A B C PROCESS: a name given to a method of purifying sewage by sulphate of alumina, blood, charcoal and clay.

ABD (Arab. "slave"); Abd-Allah, "Slave of God," generally romanized as "Abdullah." Abdul Hamid, "Slave of the Praiseworthy," i. e., God; Abdul or Abd-el-Aziz, "Slave of the Beloved."

ABD ALLAH IBN AL MUTTALIB, ban'-ăl-moot'ă-lĕb, father of Mohammed: b. 554, according to Al Kalbi. As Mohammed was born in 571 this would make his father only 17 years old at the time. As stated definitely in the Koran, Mohammed was an orphan shortly after his birth. Aside from these bare facts little of any certainty is known of the father of the Prophet.

ABD ALLAH IBN ZUBAIR, 'bn'zoo'bĕr, Moslem Caliph: b. 622: d. 692. He was the son of Zubair, nephew of Mohammed, the Prophet, and the grandson of Abu Bekr. After the death of Husain he had himself proclaimed caliph by the people of Mecca in 681, taking the title of Amir al Muminin. Soon he was attacked by the armies of Yazid and was besieged in Mecca. Yazid's death, however, in 683, put an end to the siege, and Irak, Arabia and the greater part of Syria recognized Abd Allah as caliph. But presently Abd al Malik renewed the war and again laid siege to Mecca. After a long resistance the city finally fell in 692, and Abd Allah was slain.

ABD AL LATIF, lă-tēf, Arabian writer and physician: b. Bagdad, 1160; d. while on a pilgrimage to Mecca, 1231. After his early studies, which consisted, after the custom of the time and the people, of memorizing the Koran and other literary works, he went to Damascus, which was then the centre of learning of the Moslem world. While in Egypt Abd al Latif became acquainted with Maimonides, the great Jewish philosopher. At Cairo he became a teacher of medicine, though he also devoted much time to traveling. Abd al Latif is supposed to have written many works, but of these only his 'Account of Egypt' is preserved. This work was translated into Latin by White (1800), and into French by De Sacy (1810).

ABDALWADIDS, ăb'dạl-wă'dĭdz, a Berber dynasty of Tlemcen, sometimes referred to as Banu Zayyan, after the father of the first independent king, whose reign began in 1239. Of the early origin of the family little is known, but there are ample records to prove that the Abdalwadids reigned wisely for more than three centuries over the western part of Algiers, the dynasty terminating in 1554.

ABD EL AZIZ, ăbd-ool-a'zēz', Sultan of Morocco, son of Sultan Mulai Hassan: b. Marakesh, 1880. In 1894 he succeeded his father as Sultan. So progressive was he in his tendencies and so friendly toward Europeans that he aroused thereby the fanaticism of his people. Taking advantage of this, a prophet, Bu Hamara, precipitated a formidable rebellion in 1902, bringing about the intervention of France. This was finally followed by the Algeciras Conference, in 1906, by which France and Spain undertook to maintain law and order along the Moroccan Coast, Abd el Aziz agreeing to co-operate with these two European nations. But this promise he found difficulty in keeping on account of his growing unpopularity. The following year Mulai Hafid, elder brother of the Sultan, headed a rebellion of the southern tribes and Abd el Aziz was obliged to remove his capital from Fez to Rabat. In spite of the support of France, both moral and financial, he was unable to maintain his authority, and in January 1908 the throne was declared vacant by the priesthood of Fez and immediately offered to Mulai Hafid. Realizing that his attempt to regain his authority by force would prove futile, Abd el Aziz compromised with his brother and retired to private life in Tangier.

ABD EL KADER IBN MOUHI AD DIN, äb'dĕl-kä'dĕr 'bn' moohē ad-dēn, noted Arab chief: b. near Mascara, 1807; d. Damascus, Egypt, 26 May 1883. He was educated at Ghetna in an institution maintained by the Marabouts. When only eight years of age he went with his father on a pilgrimage to Mecca. In 1827, when 20 years of age, he visited Egypt, where he came in first contact with Europeans. His first entry into the affairs of public life was when Algiers was conquered by the French. On the defeat of the Turks, Abd el Kader placed himself at the head of the Arab tribes of the province of Oran and declared himself an independent ruler. On 3 Dec. 1833 he fought a bloody battle with the French, in which the French were decidedly beaten. A month later he again attacked the French under General Desmichels, commanding all the forces of France in Oran, and compelled him to recognize his authority. The result was that his power increased rapidly and he was proclaimed sultan by all the surrounding tribes and peoples. The truce with the French was only temporary, however, and in 1841 Abd el Kader was completely defeated and driven into Morocco. Here he appealed to the people in the name of Islam and declared a religious war. France then turned her attention to Morocco, the operations finally terminating in the Battle Isly, in 1844, after which the Sultan of Morocco repudiated Abd el Kader. The latter attacked the Moors on the night of 11 Dec. 1847, but was heavily defeated and obliged to flee to Algeria, where he was compelled to surrender to the French. Abd el Kader was now taken a prisoner to France. For five years he was held in France, though allowed an annuity of 100,000 francs. Finally, in 1852, Napoleon III liberated him, whereupon he retired to Brussa, Asia Minor, later removing to Damascus. During the massacres in Syria, in 1860, he rendered the Christians such services that Napoleon III awarded him the Grand Cross of the Legion of Honor. In 1865 he visited Europe again and was present at the Paris Exposition in 1867. During his later years he engaged in literary labors, writing a religious work, which was later translated into French (1858) under the title 'Rappel à l'intelligent: avis à l'indifférent.'

ABD EL MUMIN ABU MOHAMMED, äbd äl moo'mĕn ä'boo mō-hăm'mēd, Moorish ruler, founder of the Almohades dynasty: b. Tajira, North Africa, 1094; d. 1163. He was a member of the Kumiya, a Berber tribe. He became a close friend of Ibn Tumart, founder of the Almohadea sect, and when that leader died he was chosen as his successor. Announcing himself as a caliph, he met the Almoravides in battle, put them to flight and then began a campaign of conquest that did not cease until he had subdued the cities of Oran, Tlemcen, Fez, Salé, Ceuta, and finally Morocco. Having established himself firmly in Africa he crossed over into Spain and conquered Cordova in 1148, Almeria in 1151, and Granada in 1154, until the greater portion of Mohammedan Spain was under his control.

ABD-ER-RAHMAN I, äbd-er-rä'măn, founder of the Moorish emirate (later caliphate) of Cordova (q.v.): b. Damascus, 731; d. 788. He was a grandson of the Ommiad caliph Hishám, and having fled to Africa escaped the frightful massacre of his family (see OMMIADS and ABBASSIDES) by Abu 'l-Abbas; a hunted fugitive in the desert, but faithfully protected by the tribesmen, who respected his blood and pitied his misfortunes. Meanwhile Spain was seething with anarchy; each new caliph sent a new emir there; the governor of Africa claimed the right to interfere on the ground that the African governors had captured it; the native chiefs were unwilling to submit to a constant succession of interlopers with no interest but their own, and at last the situation became so intolerable that the Spanish Arabs determined to choose a ruler with his residence in Spain. They selected the wandering heir of the overthrown house, and seeking him out in Africa offered him the place. He landed in Spain 25 Sept. 755, and fixed his royal seat at Cordova. His reign was one of incessant warfare. Hosein ben-Yahya, the Abbasside emir, driven from Spain, fled to Charlemagne and implored his assistance; it was granted and Hosein was re-enthroned at Saragossa, but while the Frankish army was returning through the Pyrenees, the Basque mountaineers fell upon the rear-guard and annihilated it in the pass of Roncesvalles, with its commander Roland. Saragossa was taken after two years' siege, Hosein put to death as a rebel, and Spain to the Pyrenees subdued. A formidable rising in 786 was crushed, and Abd-er-Rahman had two years of life to devote to the arts of peace and the building of his famous mosque at Cordova (now used as a cathedral), with its rows of cupolas supported by 850 pillars of jasper.

ABD-ER-RAHMAN III, the greatest of the caliphs of Cordova, and the first under whom the emirate assumed the title of caliphate: b. 891, acceded 912; d. 961. Measured by what he found and what he left, he must be counted among the ablest rulers of history. The former was a throne to which most of the provincial governors had thrown off allegiance, and the rest rendered such obedience as suited them; a country in a state of permanent anarchy and civil war, perishing of racial, religious, and factional quarrels between Arabs and Moors; the Fatimite dynasty establishing a great empire in Africa, and looking for a speedy succession to the heritage of Spain; on the north, the new Christian states rapidly growing,—Alfonso III had recently moved his capital across the mountains to Leon, and Sancho had founded the kingdom of Navarre,—so that what escaped the Africans would probably fall into the hands of the Christians. Abd-er-Rahman first put down the worst internal revolt, that of the family of the old brigand Omar ben Hafsun, whose stronghold in the mountains of Andalusia had become a centre for all the renegades, Christians, and rebels of the south. He tied the hands of the Fatimites by subsidizing the native princes who held out against them. The northern danger was the worst. Ordono II in 914 raided the territory of Merida; and though Merida had thrown off allegiance to Cordova, Abd-er-Rahman wished the more to show them that he was their protector. Collecting and equipping a splendid army, in 918 he gained a great victory over the combined forces of Leon and

Navarre, following it up with several campaigns in which he penetrated to Pamplona, the capital of Navarre. These victories were not final: his fortunes were checkered on the Christian side, and he suffered some defeats. But his suzerainty over Navarre was recognized, and in 960 a deposed king was reseated on the throne of Leon by Abd-er-Rahman's troops. Internally his success and glory were unqualified. At his death he left a consolidated kingdom, a full treasury in place of an empty one, internal order kept by a vigilant police, flourishing agriculture based on scientific irrigation, prosperous industries, commerce whose customs dues furnished the majority of the revenue, an income of which one-third paid the current expenses and another third was used for building, and the rest kept for a reserve, the best army in Europe, a superb navy which made him lord of the gates of the Mediterranean, and equality in diplomatic rank with the proudest sovereigns of the world.

ABD-ER-RAHMAN, Saracen chieftain who led an army of nearly 90,000 into Gaul, and was defeated and slain near Poitiers (usually known as the battle of Tours) by Charles Martel (q.v.).

ABD-ER-RAHMAN. See also ABD-UR-RAHMAN.

ABDICATION, in strictness, the renunciation of any office by the holder before the expiration of its term; in actual use, applied only to sovereign rulers, *de jure* or *de facto,* who resign the crown in their lifetimes. The motives for this are as various as human fate, character, policy, or necessity, or the events of history. It may be compulsory — in which case it is really not abdication but deposition — or voluntary. Compulsion may come from foreign conquest; from foreign commands when the king is a puppet, as with the later Polish kings, or Napoleon's shifting his brothers from throne to throne; from the commands of *de facto* controllers of the state within, as with the puppet Roman emperors under the barbarian commanders-in-chief of the army; or from popular or factional insurrections. If voluntary, it may be from desire to let a constitutional machine have a fair chance to work alone, as with Sulla and Diocletian; from satiety with royal power and weariness of royal burdens, as with Murad II of Turkey; from physical ailments and discouragement, as with the Emperor Charles V; from penitence and desire to live a religious life, as with more than one mediæval prince who furnished real models for Shakespeare's usurper in 'As You Like It'; from weariness of the restraints of royal etiquette, as with Christina of Sweden,— perhaps also sincere conversion to Catholicism and unwillingness to enforce a Protestant establishment; from unwillingness to obey an overlord to the harm of his kingdom, as with Louis Bonaparte of Holland; from inability to face the results of crushing defeat, as with Charles Albert of Sardinia· from acceding to a higher throne, as with Charles of Naples; from shame at the results of a bad policy, as with William I of the Netherlands; from unwillingness to retain a throne against the popular will, as with Louis Philippe — for his resignation was not enforced; or other reasons. In monarchies as a whole, the sovereign can abdicate at will; in England, only by consent of Parliament — which however, as in the case of James II, can assume an implied abdication which the monarch had no intention of executing, the term being a euphemism for deposition.

The following is a list of some of the chief historical abdications, with their dates:

Sulla the Dictator	B.C. 79
Diocletian the Emperor	A.D. 305
Benedict IX, Pope	1048
Stephen II of Hungary	1131
Ladislas III, Duke of Poland	1206
Albert the Bear of Brandenburg	1169
Celestine V, Pope	13 Dec. 1294
John Balliol of Scotland	1296
Joannes Cantacuzenos, Emperor of the East	1355
Richard II of England	1399
John XXIII, Pope	1415
Eric VII of Denmark and XIII of Sweden	1439
Murad II, Ottoman Emperor	1444 and 1445
Charles V, Emperor (Netherlands)	25 Oct. 1555
(Spain, Sicily and the Empire)	1556
Christina of Sweden	1654
John Casimir of Poland	1668
James II of England	1688
Frederick Augustus of Poland	1704
Philip V of Spain	1724
Victor Amadeus II of Sardinia	1730
Ahmed III, Ottoman Emperor	1730
Charles of Naples (on accession to throne of Spain)	1759
Stanislaus II of Poland	1795
Charles Emanuel IV of Sardinia	4 June 1802
Charles IV of Spain	19 Mar. 1808
Joseph Bonaparte of Naples (transferred to Spain by Napoleon)	6 June 1808
Gustavus IV of Sweden	29 Mar. 1809
Louis Bonaparte of Holland	2 July 1810
Napoleon I of France	4 April 1814 and 22 June 1815
Victor Emanuel of Sardinia	13 Mar. 1821
Charles X of France	2 Aug. 1830
Pedro of Brazil	7 April 1831
(Also abdicated the throne of Portugal in favor of his daughter, at once on his accession in 1826.)	
Miguel of Portugal	26 May 1834
William I of Holland	1 Oct. 1840
Louis Philippe of France	24 Feb. 1848
Louis Charles of Bavaria	21 Mar. 1848
Ferdinand of Austria	2 Dec. 1848
Charles Albert of Sardinia	22 Mar. 1849
Leopold II of Tuscany	21 July 1859
Isabelle II of Spain	25 June 1870
Amadeus I of Spain	11 Feb. 1873
Abd-ul-Aziz, Sultan of Turkey	30 May 1876
Alexander of Bulgaria	7 Sept. 1886
Pedro II of Brazil	15 Nov. 1889
Milan of Servia	6 Mar. 1889
Emperor Hsuan-Yung of China	12 Feb. 1912

ABDIEL, ăb'dĭ-ĕl ("servant of God"), the one loyal seraph in heaven, according to 'Paradise Lost,' "among the faithless, faithful only he," who withstands Satan when the latter is inciting revolt against God for promoting his Son over the heads of the angel peers. Milton took the name from the Jewish cabalists.

ABDOMEN, ăb-dō'mĕn, in human anatomy, that portion of the body bounded above by the diaphragm, below by the pelvis, behind by the lumbar vertebræ, and in front by a thin layer of muscles, the abdominal muscles. This cavity contains the chief organs of digestion and the genito-urinary system. By reason of the movements of the diaphragm it is rhythmically changing its size, and the movements of the intestines somewhat modify its internal contour. For purposes of description and for localization the abdomen is divided by a tit-tat-toe figure into nine regions; the upper and lower horizontal lines passing at the lower level of the ribs and the upper borders of the pelvis. From above downward

the middle squares are termed the epigastric, the umbilical, and hypogastric; to the sides of the epigastric regions are the right and left hypochondrium (under the ribs); the right and left lumbar flank, the central umbilical region, and the right and left iliac regions lie down in the pelvis on either side of the hypogastric area. The general location of the abdominal viscera in the various areas is of interest. The liver lies up under the ribs in the right hypochondrium, stretching over the upper part of the epigastrium into the left hypochondrium; the stomach lies mostly in the left hypochondrium and reaches into the epigastrium just below the sternum; the large intestine starts in the right iliac region, the appendix being there also, goes up the right lumbar into the lower portion of the right hypochondrium, crosses straight over, dipping slightly into the umbilical region, from the left hypochondrium it descends into the left iliac region and then turns back into the centre and ends at the rectum. The small intestine occupies most of the umbilical region, extending out into the others. The pancreas lies just behind the lower end of the stomach in the epigastrium. The spleen lies higher up on the left side behind, resting on the 10th and 11th ribs; the kidneys are behind high up, in the hypochondriac lumbar region, just coming below the free borders of the ribs; most pains in the small of the back thought to be kidney pains are pains from constipated bowels; kidney pains are high up under the ribs behind. The genital organs lie in the hypogastric and right and left iliac regions, the bladder low in front in the centre, the uterus slightly above in the centre, the ovaries to the right and left in the right and left iliac fossæ.

In entomology, the whole body of an insect behind the thorax. It usually consists of rings or short hollow cylinders, which are united by a joint or membrane, and in some cases, as in the grub of the chameleon fly, slide upon one another like the tubes of a telescope. Sometimes it bears a sting or an ovipositor, though in the perfect insect no appendages are found.

An abdominal ring is one of two oblong tendinous openings or «rings» existing in either groin, or in the right and left inguinal regions. Through these rings pass the spermatic cord in the one sex, and the circular ligament of the uterus in the other. Consult Taussig, F. J., 'Surgical Diseases of Abdomen' (1910); Gray, 'Human Anatomy' (1916).

ABDUCTION, the act of abducing or abducting; a taking or drawing away, and specifically an unlawful taking. In the United States the word abduction is ordinarily applied to the illegal seizure and detention of a female for the purpose of concubinage, prostitution or marriage. The punishment for abduction varies in the different States of the Union. The tendency of American legislation is to extend the scope of the term beyond its common law limits. In many States the statutes in express terms look to the punishment and suppression of the vices which are involved in the sexual acts usually contemplated in the unlawful taking or enticing of females. They are variously directed against the taking of a woman against her will for the purpose of compelling her by force, menace, etc., to marry; against the taking of a female under a designated age, without the consent of her lawful custodian, for the purpose of marriage; against the taking and detaining of any woman against her will, with intent to have carnal knowledge of her, or that another shall have such knowledge; against the inveigling or enticing of an unmarried female of previous chaste character into a house of ill fame, assignation or elsewhere, for the purpose of prostitution or sexual intercourse, or against the taking and seduction of a girl under a designated age.

In common and English law this offense is of three kinds: (1) If any person shall maliciously, either by force or fraud, lead, or take away, or detain, any child under the age of 10 years, with intent to deprive the parents or other persons having the lawful charge of such child, or with intent to steal any article on its person; or shall receive or harbor such child, knowing the same to have been so stolen or enticed,— every such offender shall be guilty of felony, and shall be liable to penal servitude for not more than seven or less than three years, or imprisoned, with or without hard labor, for any term not more than two years. (2) If the girl is under the age of 16 years, the offender shall be guilty of misdemeanor, and being convicted thereof shall be liable to suffer such punishment, by fine or imprisonment, or both, as the court shall award. (3) If any person shall, from motives of lucre, take away or detain against her will, any woman having any interest, present or future, in any real or personal estate, with intent to marry or defile her, or to cause her to be married or defiled by any other person, every such offender, and every person counseling, aiding, or abetting such offender, shall be guilty of felony, and liable to penal servitude for life, or for any time not less than three years, or to be imprisoned, with or without hard labor, for any term not exceeding five years. If the woman first consent to be taken away, and afterward refuse to continue with the offender, and he forcibly detain her; or if she be forcibly taken away and she afterward consent to her marriage or defilement; or if she be taken away with her own consent, obtained by fraud or imposition, the offense is the same. But if a man, without fraud, deceit, or violence, marries a woman under age, without the consent of her father or guardian, that act is not indictable at common law.

In logic, abduction is a form of reasoning in which the greater extreme is contained in the medium; but the medium is not so evidently in the lesser extreme. Example: «Whatever God has revealed is certainly true; now God has revealed a future retribution; therefore a future retribution is certainly true.» In the use of this kind of reasoning the minor proposition must be proved to be contained in the major.

ABDUCTOR, a muscle, the office of which is to draw a limb or portion of a limb to which it is attached away from the centre of that limb. Abductor of the thigh, for example, raises the thigh away from the centre of the body.

In law, a person guilty of abduction.

ABD-UL-AKHAD-KHAN, ăbd-ool-äk-ad'-kan, Amir of Bokhara: b. 1852; d. 4 Jan. 1911. Head of modern state of Bokhara (q.v.) which was founded by the Usbegs in 15th century after the power of the Golden Horde had been crushed by Tamerlane. At the instance of Russia he abolished slavery and was considered a capable and conscientious ruler. He succeeded his father Muzaffer 12 Nov. 1885, who was the fifth Amir of Bokhara, of the dynasty of Manguts, which dates from end of 18th century. Muzaffer (1866) proclaimed a holy war against Russia, was defeated and forced to sign a treaty ceding what is now the Russian district of Syr-Daria, besides paying a large war indemnity and permitting Russian trade. Later another treaty was signed (1873) and the state became a Russian dependency. Abd-ul-Akhad upon his death was succeeded by his son, SAYID AMIR ALIM, b. 3 Jan. 1880, the present ruler of Bokhara.

ABD-UL-AZIS-HAN, äb'döl-ä-zĕz'-hăn, 32d Sultan of the Ottoman Turks: b. 9 Feb. 1830; succeeded his brother Abd-ul-Medjid (q.v.), 25 June 1861; d. 4 June 1876. At first he showed himself liberal-minded and open to Western ideas, promising economy and reform. But ere long he began to spend vast sums on his army, the embellishment of his capital, hunting and costly journeys. The most important of his political trips was in 1863 to Egypt, where he was accompanied by Fuad-Pasha. In 1867, at the time of negotiation about Crete, notwithstanding the misunderstandings existing between the Sublime Porte and European powers, Abd-ul-Azis went to Paris where he had a sumptuous reception at the Universal Exposition, and, in July of the same year, spent two weeks in London. His government had great difficulties to contend with in the Cretan insurrection of 1866, the struggle with Rumania and Serbia for full autonomy and finally the outbreak of Mohammedan fanaticism. In 1871, after the death of Aali-Pasha, the Sultan strove to have the succession settled upon his son, Yussuf-Izedin, instead of his nephew Murad, according to Turkish custom. He next tried to set Russia against the other powers and plunged ever into deeper financial difficulties, while his stupid misgovernment alienated the provinces and led, in 1875, to risings in Bosnia-Herzegovina, Bulgaria and the Pashalik of Belgrade. At last a conspiracy forced him to dismiss his ministers, and next to abdicate the throne, 30 May 1876. Four days later he was found dead. He was succeeded by his nephew Mehmed Murad, who was shortly deposed on the ground of alleged insanity, in favor of Sultan Abd-ul-Hamid, and finally murdered. Consult Millingen (Osman Saifi-Bey) 'La Turquie sous le regne d'Abd-ul-Azis' (Brussels 1868); "Sultal Abd-ul-Azis," in the *Unsere Zeit* (Vol. I, Leipzig, 1877).

ABDUL BAHA, eldest son of Mirza Ali, b. 23 May 1844. He has been, since his father's death in 1892, the spiritual head of the Bahai movement. He was one of the exiles in Akka, where he shared his father's trials and tribulations and, in his later years, the burdens of the spiritual and social direction of the Bahai colony. From his exile he continued the work of spreading a knowledge of the Bahai doctrine which, under his able management, attracted wider and deeper interest than it had under either of his predecessors in office. Carefully educated, widely read in almost every line of thought and study, and trained under his father, Abdul Baha brought to the performance of his duties sympathy, conviction, enthusiasm, able executive ability, a broad liberality and a strange Oriental fascination of character, which has made him a power in the religious life of Persia for a quarter of a century. To him in exile came literally streams of people from all over Asia. He communed with them, advised with them, taught them and sent them forth converts, apostles and teachers of the faith. Born of one of the noblest families in Persia, of the faithful of the faithful, he disregarded race, and religious prejudice, caste and color. To him came millions of letters in a single year from all parts of the world; and he answered them all personally. He kept a staff of interpreters and secretaries. All kinds of problems he handled, as they troubled his visitors or followers, personal, religious, social, political. His fame reached the western world and he was invited to represent Bahaism at the Universal Race Congress held in London in July 1911. This he was not able to do but he forwarded a paper on Spiritual Unity which attracted much attention and, in general, favorable criticism. In this paper he took the position that only spiritual unity could solve the many race problems now facing the world. Before the end of the year he visited England where he was given a warm welcome. There he made addresses before many churches, clubs, associations and societies, among them being the congregation of Archdeacon Wilberforce, St. John's, Westminister. Even still greater interest was shown in his work and personality in the various other countries of Europe which he visited, more especially by France. One of the most cosmopolitan gathings ever met together welcomed him to Paris. He also visited Egypt in December 1911. He reached New York in April 1912 where he delivered many addresses, one of them before the congregation of the Church of the Ascension. He visited Chicago, Washington and a score of other cities from coast to coast and spoke to Jew and Gentile, Catholic and New Thought, Mormon and Free Mason. After nearly six months on this side of the Atlantic he returned to England where he spent six weeks and another two months in France. Germany and Austria also entertained him on into the following year, when he returned home to the land of his "exile."

Abdul Baha has ever been one of the strongest advocates of the disarmament of nations, which he asserts is the first requisite of international peace. This is the natural outcome of his religious dogma of social unity in spiritual thought. "No man," he asserts, "except the madman, plots against an unarmed man; and no institution, except the outlaw institution, plots against those institutions devoted to the service of humanity, as, for example, the Salvation Army, and the Red Cross." Among the works of Abdul Baha are: 'The Mysterious Forces of Civilization,' and 'Tablets of Abdul.' See MIRZA HUSAIN ALI NURI; and BAHAISM.

ABD-UL HAMID I, äbd-ool-hä-mid', 27th Sultan of Turkey, son of Ahmed III: b. 1725; d. 19 April 1789. He succeeded his brother Mustapha III in 1774. He was involved in two wars with Russia, and the treaty of Kutchuk-Kainardji in 1774 compelled him to relinquish Kabardia, Eni-kale, Kerch, Azov and Kinburn. He was also forced to grant free navigation in the Black Sea, the protectorate of Russia over the provinces of Wallachia and Moldavia, guarantee the partition of Poland and independence of the Crimean Tatars. This Sultan succeeded in quelling the rebellions instigated by several of his pashas and, recognizing the superiority of the European military system, invited French officers for the purpose of fortifying the fortresses of his empire. In 1787 a war broke out between Turkey and Russia and the latter's ally Austria which ended in the disaster of the Ottoman fleet at Kimburn (30 Dec. 1788) and the loss of Ochakov. In the last years of his reign Abd-ul Hamid suffered from mental and physical disorders and died 19 April 1789, just when he was preparing for a formidable invasion to the north of his empire. He was succeeded by his nephew Selim III. Consult Azim-Tarischi, 'History of Abd-ul-Hamid and Selim III' (Constantinople 1867).

ABD-UL-HAMID II, 34th Sultan of the Ottoman Empire: b. 22 Sept. 1842, second son of Abdul-Medjid, reigned from 1876 to 1909, when he was deposed and made a state prisoner for life. His uncle, Abdul-Aziz, a profligate debauchee, was dethroned by Midhat Pasha (q.v.) in 1876, and was found shortly after with the veins of his wrists cut open with a pair of scissors. Whether it was a case of suicide or murder has never been decided. Abdul-Hamid's brother Murad V ascended the throne, but was deposed again in a few months' time owing, it was said, to a disordered mental condition, and Abdul-Hamid reigned in his stead. Up to that time he was known as a debauched weakling, brought up in the luxurious atmosphere of the harem. No sooner, however, had he grasped the reins of power, than he proved himself a despotic ruler of the strongest type, and developed into one of the cleverest and most unscrupulous diplomatists of his age. At the time of his accession, the country was in a deplorable condition. Torn by revolution, corruption and bankruptcy within her borders, Turkey was threatened with war outside by her hereditary enemy, Russia. Even the European powers who had labored and fought to keep the «Sick Man of Europe» alive, were clamorously demanding the introduction of long-promised and necessary reforms. By a skilful policy of apparent acquiescence in every demand made upon him, the new ruler managed for a time to relieve the external pressure and devoted his immense energy to reorganizing the army and the finances of the state. He speedily crushed the insurrection in Herzegovina and Bosnia; by galvanizing his tottering empire with new life and vigor, he showed an astonished world that the Turk was not so «sick» as his numerous doctors imagined. A rejuvenated Turkey was the last thing that Russia desired, and Alexander II lost no time in declaring war. Abdul Hamid accepted the challenge and conducted the war with remarkable ability. But his enemy was too strong for him, and he committed the fatal error of interfering too much with his generals. The surrender of Osman Pasha at Plevna (q.v.) to the Russians and Rumanians opened a clear passage for the victors to Constantinople. As before in the Crimean War, Great Britain again came to the rescue. Disraeli ordered the British Fleet to the Dardanelles and mobilized the fighting forces of the whole British Empire. This unexpected move checked the Russian advance; the Treaty of San Stefano (q.v.) was nullified by the Berlin Congress, and a totally undeserved new lease of life was granted to the worst-ordered state in modern history.

The Treaty of Berlin deprived Turkey of her Balkan principalities: Herzegovina, Bosnia, Kars and Batum, but she was still permitted to retain her suzerainty over Eastern Rumelia.

The gloom of the Hamidian era settled like a pall over the land of the Osmanli. The constitution and parliament inaugurated by Midhat were abolished; the control of every department of state was centralized in the hands of the Sultan, and the liberal grand vizier, Midhat Pasha, was exiled to Arabia and strangled. He was too honest and too democratic to please his imperial master. European jealousy had hindered Russia from wiping out the plague spot of Europe, and Abdul Hamid was clever enough to utilize that jealousy by playing one power off against the other. His one aim was to maintain absolute autocracy at home and to evade the demands of the «infidels» abroad. The methods he employed in the process were truly Oriental: espionage, bribery, murder and terrorism. Many powerful persons who disagreed with him were quietly removed and never heard of again. High positions were conferred upon unscrupulous tools or sold to the highest bidder. The governors of provinces were permitted to squeeze and tyrannize over the unhappy people they were supposed to govern; wholesale massacres of Christian subjects were encouraged — or at least tolerated. Hordes of savage Kurds exterminated Armenians by the thousand; unspeakable atrocities sent many a thrill of horror throughout the civilized world; international representations and diplomatic «Notes» were simply showered upon the hermit Sultan, who smilingly accepted them all and calmly pursued the uneven tenor of his way. Nemesis, however, prepared a belated instrument of vengeance to compass his downfall — the Young Turk Party. Persecuted, imprisoned and judicially murdered at home, the survivors of the party carried on their propaganda as the «Committee of Union and Progress» in Paris, Geneva and London, whilst secret agents canvassed among those without whose help nothing could be done — the Turkish army officers. The Albanians, the finest soldiers in that army, went over in a body to the revolutionary movement. The hour struck on 22 July 1908, when Majors Niazi Bey and Enver Bey raised the flag of military revolt at Resna, in Macedonia, where they were stationed in command of the troops. They proclaimed the Constitution and threatened to march on Constantinople. Seeing that he could no longer count on the loyalty of his soldiers, Abdul-Hamid became thoroughly alarmed and capitu-

lated at once. Making a virtue of necessity, he immediately restored the Constitution he had abrogated in 1878. Great rejoicing prevailed, especially when, on 1 August the Sultan issued a Hatt-i-Humayun assuring to the people those elementary principles of freedom and justice they had never before enjoyed. The revived Turkish Parliament opened on 15 Jan. 1909. Kiamil Pasha, the aged grand vizier, referred to the "wise and prudent policy" of the Sultan "in putting himself at the head of the revolution." The Government soon resigned, however, owing to internal dissensions. Serious disturbances broke in the provinces; in Ardana, Asia Minor, thousands of Armenians and two American missionaries were massacred. The spirit of Abdul-Hamid inspired his followers to restore the old order of things, and there is no reason to doubt that he instigated the mutiny that broke out (14 April 1909) among the troops still loyal to him. They seized the Parliament House, telegraph offices and bridges of the city. Two members of the Committee were murdered and several others arrested. The minister of justice was killed and the minister of marine wounded. For the moment it seemed that Abdul-Hamid would emerge victorious from the crisis, but the Committee of Union and Progress promptly sent troops to Constantinople to crush the counter-revolution. On 24 April Gen. Mahmud Shefket Pasha entered the city with a "constitutional" army. Considerable street fighting developed with the "loyalists," who were easily overcome by the Young Turkey leaders. It was then decided to depose the Sultan and replace him by his younger brother Mohammed Reshad Effendi, who had for many years been kept in isolation to prevent the very event which was now to happen. (See MOHAMMED V). The ringleaders of the counter-revolution were court-martialled and 40 of them hanged in the principal public squares of the city. Abdul-Hamid was banished to Salonica with his dogs, birds, carpenter's tools, and a few members of his harem. An expert cabinet-maker, he frequently presented writing desks of his own make to foreign diplomatists. Many uncomplimentary epithets were applied to him during his dark reign, such as "The Great Assassin," "Abdul the Damned," and "The Unspeakable Turk." Consult Pears (Sir) E., 'Abdul Hamid' (in Makers of the Nineteenth Century Series, New York 1917).

ABDULLAHI. See KHALIFA, THE.

ABD-UL-MEDJID, äbd-ool-me-jid', 31st Sultan of the Ottoman Turks, son of Mahmud II; b. 23 April or 6 May 1823; acceded 1 July 1839; d. 25 June 1861. He received the usual enfeebling harem education, his father failing in his efforts to rescue his children from the system. On his accession Turkish affairs were critical. The great viceroy of Egypt, Mehemet Ali, had a second time revolted; 10 days previously the Turkish admiral had turned traitor and put the entire fleet in his hands; and three days afterward Mehemet's son Ibrahim, the greatest Moslem soldier of the century, had routed the Turkish army at Nizib, and was marching straight on Constantinople, where the orthodox party, enraged at Mahmud's reforms, had conspired to place Mehemet Ali on the throne. But the European powers interfered, and the treaties of 27 Nov. 1840 and July 1841 confined Mehemet to Egypt again. Abd-ul-Medjid at once set about complying with his father's express instructions and carrying out his reforms: 3 Nov. 1839, he promulgated the "Hatti-sherif of Gulhané," placing all his subjects on full religious and civil equality, and providing for security of life and property to all, with just and equal taxation, administration of laws, and conscription; February 1856, after the Crimean War, it was supplemented by another to the same purport. But the Mussulman aristocracy and the educated classes (Ulema) regarded it as an anti-Mussulman revolution to no profit but that of the infidels, and fought it so furiously that it remained practically inoperative, and rather sharpened the edge of their ill-treatment of the Christians; and repeated conspiracies were formed against his life, whose members however the kindly Sultan would not put to death. His right hand in reform work was the able and humane Reshid Pasha, a Mussulman educated in France: through him the army was reorganized 1843–44; a board of education instituted 1846; a university founded, with military, medical, and agricultural colleges; a hateful capitation tax abolished, slave-trading repressed, and commerce advanced. Nothing can better prove the intrinsic and hopeless rottenness of the Mussulman system under modern conditions than the fact that these measures were written in water and died almost with their birth; their main fruit was bloody insurrections in various parts of the empire, of which the great Syrian massacres of 1860 (see SYRIA) were the worst. In 1849 Abd-ul-Medjid honored himself by boldly refusing to surrender Kossuth and the other Hungarian refugees, after the failure of the Hungarian revolution, at the joint demand of Russia and Austria. For the Crimean War, and its antecedents and results, see that head. In later life he sank into extravagance and sensuality; but he was essentially a good-hearted and honorable man, powerless against fate. He was succeeded not by one of his seven sons, but by his brother Abd-ul-Aziz, the oldest living member of the house of Othman.

ABD-UR-RAHMAN, äbd-oor-rä'man, Sultan of Fez and Morocco: b. 1778; succeeded his uncle 1823; d. 1859. His first four years of rule were occupied in quelling insurrections. Next, Austria refused to pay the tribute for safety against pirates levied by Morocco on European ships in the Mediterranean: the Sultan wisely adjusted the dispute by relinquishing this blackmail. (See MOROCCO.) The religious war under Abd-el-Kader against the French in Algeria involved Morocco in its movements: the defeat by the French in 1844 compelled the Sultan to order Abd-el-Kader to quit the country, which, however, he did not for three years longer. The piratical habits of the Moroccans brought him to the brink of war with more than one European state. He was succeeded by his eldest son, Sidi-Mohammed (1859–73).

ABD-UR-RAHMAN-KHAN, äbd-oor-rä'-man-Hän, amir of Afghanistan, son of Afzul (uf'-zool) Kahn, nephew of the amir Shere Ali, grandson of Dost Mohammed: b. Kabul, 1844; d. 3 Oct. 1901. During the civil war of 1864 in Afghanistan (q.v.) between Dost Mohammed's sons, he played a leading part on his father's

side against his uncle, won several battles,—the important victories of Shaikhabad and Khelat-i-Ghilzai were mainly due to his ability,—and for a time his father seemed secure of the amirate; Abd-ur-Rahman was made governor of Balkh, and won great popularity by his moderation and by marrying the daughter of the chief of Badakh-shan. In 1868, however, Shere Ali gained the mastery, and the English government helped to put down further resistance for order's sake. Yakub-Khan drove out his cousin Abd-ur-Rahman, who after hunted wanderings reached Russian territory, and General Kaufman allowed him to live at Samarcand with a pension of 25,000 rubles a year. Here he remained till 1879, when Shere Ali's death, and the weakness of Yakub, whom the English had recognized as amir, gave him a chance to return to Balkh, where he was welcomed. The murder of the British Resident at Kabul and Yakub's deposition followed; Abd-ur-Rahman came forward once more, and was acknowledged amir by the principal chiefs and the English government, which gave him a subsidy of £160,000 a year, and large gifts of artillery, rifles, ammunition, etc. In 1893 the Indian government turned over to him Kafiristan, in the Hindu-Kush mountains, and he brought its savage tribes under control in 1896. The English government showed him great honor, as he deserved; and made him G.C.B. and G.C.S.I. He was succeeded by his eldest son, Habibullah-Khan, who had been associated with him in the government for some time.

A BECKET, Thomas. See BECKET, THOMAS Á.

A'BECKETT, Arthur William, English novelist and dramatist, son of Gilbert Abbott A'Beckett: b. London, 25 Oct. 1844; d. 1909. From 1865 to 1868 he was editor of *The Glowworm*, after which he edited the *Britannia Magazine* until 1870. When the Franco-Prussian War broke out he was sent to the theatre of war as special correspondent by the London *Standard* and *Globe*. In 1874 he became a member of the editorial staff of *Punch*, a position which he retained continuously until 1902, when he resigned to become editor of *John Bull*. Among his works are: 'Modern Arabian Nights' (1885); 'London at the End of a Century' (1900); 'The A'Becketts of Punch' (1903); 'Recollections of a Humorist' (1907).

A'BECKETT, Gilbert Abbott, English humorist: b. London, 9 Jan. 1811; d. Boulogne, 30 Aug. 1856. He began life as a lawyer and later became a police magistrate, but he became famous as a playwright, writing over 60 plays. In collaboration with Mark Lemon he dramatized 'The Chimes' and several other works by Dickens. He was the founder of *Figaro in London*, which was later transformed into *Punch*, of whose original staff A'Beckett was a member. Among his most important works are: 'Comic History of England' (new ed. 1907); 'Comic History of Rome' (1852); 'Comic Blackstone' (1869).

ABEEL, David, American missionary: b. New Brunswick, N. J., 12 June 1804; d. Albany, N. Y., 4 Sept. 1846. He studied at Rutgers College and at the Theological Seminary of the Reformed Dutch Church and in 1827 was ordained to the ministry. For two years he was pastor of a church at Athens, N. Y., leaving there in 1829 for Canton, China, as a missionary. While in that country and in Java, Singapore, and Siam he did much good work in spreading Christianity. He returned to America in 1845, broken down in health. His published works include: 'The Claims of the World to the Gospel,' 'Residence in China,' and 'The Missionary Convention at Jerusalem.' An account of his life has been written by G. R. Williamson.

ABEKEN, ä-bę'kĕn, Heinrich, German divine and diplomat: b. Berlin, 8 Aug. 1809; d. 1872. He was chaplain to the Prussian embassy in Rome in 1834, and in 1841 visited England to arrange for the establishment of a Protestant bishopric at Jerusalem. He was attached to the Prussian ministry for foreign affairs in 1848, and in 1853 became privy councillor of legation. Associated officially with Bismarck and with King William II during the campaigns of 1866 and 1870–71. 'Heinrich Abęken, ein schlichtes Leben in bewegter zeit' (Berlin 1898) published by his widow, has much historic value. See EMS DISPATCH.

ABEL, second son of Adam and Eve, the first born being Cain. Abel became a shepherd, while Cain became an agriculturalist. At the end of the first season both offered up sacrifice to the Deity, Abel bringing the firstlings of his flock while Cain offered the first fruits of his labor. Abel's offerings were accepted but Cain's ignored, which so aroused the jealousy of the latter that he killed his brother Abel. It is not said in Genesis why Jehovah rejected the sacrifice of Cain and accepted that of Abel; but the Saviour, in the New Testament, speaks of "righteous Abel," from which it is concluded that there dwelt in him a spirit of righteousness, which was absent in his brother. The story is generally regarded as reflecting the ancient belief of the early nomadic tribes that the herding of animals is more pleasing to the Deity than the more settled life of the grower of food plants.

ABEL, Carl, German philologist: b. Berlin, 1837; d. 26 Nov. 1906. After finishing his studies at the universities of Berlin, Munich and Tübingen, he specialized in European and Oriental languages. He was, at various times, teacher of philosophical and comparative linguistics at the Humboldt Academy of Science, at Berlin, lecturer at Oxford and linguistic assistant in the German Foreign Office. Among his many works, published in German, French and English, are: 'Linguistic Essays' (1880); 'Slavic and Latin,' lectures on comparative lexicography, delivered at Oxford (1883); 'Russland und die Lage' (1888); 'Letters on International Relations before and during the War of 1870' (London 1871).

ABEL, John Jacob, American pharmacologist and physiological chemist: b. Cleveland, Ohio, 19 May 1857. He was graduated at the University of Michigan in 1883, took advanced work in physiology in the Johns Hopkins University 1883-84, studied chemistry and medicine at Leipzig, Strassburg, Heidelberg, Vienna, Berne, Wurzburg and Berlin 1884–91, taking the degree of M.D. at Strassburg in 1888. Has devoted himself to the study of chemical composition of animal tissues and fluids and to the toxic and therapeutical action of various substances and made numerous discoveries in these

fields. He has held the chair of pharmacology in the Medical School of the Johns Hopkins University at Baltimore, since 1893.

ABEL, Sir **Frederick Augustus,** English chemist: b. London, 17 July 1827; d. there 6 Sept. 1902. As a specialist in explosives he was consulting chemist in the British War Department, from 1854 until 1888, improving considerably the processes of manufacture of gun cotton and blasting gelatine. In collaboration with James Dewar he invented cordite. His most important works are: 'Gun Cotton' (1866); 'On Explosive Agents' (1872); 'Researches in Explosives' (1875); 'Electricity Applied to Explosive Purposes' (1884); 'Handbook of Chemistry' (with Colonel Blexam, 1854).

ABEL, Karl Friedrich, German musician and composer: b. Göthen, 1723; d. London, 20 June 1787. He was a pupil of Sebastian Bach and for some years a member of the famous Dresden band of the Elector of Saxony, King of Poland. In 1758 he went to England in a state of great destitution and some years later was appointed chamber musician to Charlotte, the queen of George III. He and John Christian Bach, the son of his old teacher, directed the subscription concerts, known as the Bach–Abel Concerts, from 1765 until 1782. His works include many symphonies, string quartets, trios and piano sonatas.

ABEL, Niels Henrik, Norwegian mathematician: b. Findöe, 5 Aug. 1802; d. Arendal, 6 April 1829. Having finished his studies in the University of Christiania, in 1825, he spent two years in Paris and Berlin. In 1828 he was appointed instructor at the University and at the military school at Christiania. He demonstrated for the first time the impossibility of solving general equations of any degree higher than the fourth by the elementary processes of algebra. He was one of the originators of the theory of functions, an important class of transcendental functions being known as "Abelian," after him. The binominal theorem, proved by Newton and Euler, were more widely generalized by Abel, including the cases of irrational and imaginary exponents. The results of his labors, in two volumes, were published by the Norwegian government (Christiania 1839).

ABELARD, ăb-ę-lär (Fr. **Abélard,** ăb-ā-lär), **Pierre,** pē-ār, a distinguished philosopher, and lover of Héloïse. His real name was Pierre de Palais, the other being a nickname spelled in many other ways, but originally Bajolardus, "bacon-licker," from a school joke, which he changed to Habelardus, "bacon-haver," as a retort: b. 1079 near Nantes, in the little village of Pallet, the property of his father Berengar; d. Châlon-sur-Saône, 21 April 1142. Full of intellectual enthusiasm, he gave up his patrimony to his younger brothers to devote himself to a life of study. Those studies were very wide, though the usual inclusion of Greek and Hebrew is an error; but his chief passion was philosophy, and its great implement, the scholastic logic, in which he soon became the most eminent master of his age. Having learned all that Brittany could teach him, he went to Paris, the university of which attracted students from all parts of Europe. Guillaume de Champeaux, a follower of Anselm and an extreme Realist, was the most skilful disputant of his time, and Abelard, profiting by his instructions, was often victorious over his master in contests of wit and logical acumen. The friendship of Champeaux was soon succeeded by enmity; and Abelard, who had not yet completed his 22d year, removed to Melun, whither he was soon followed by a multitude of young men, attracted from Paris by his great reputation. Hostility still pursued him, but he left Melun for Corbeil, nearer the capital, where he was still more admired and persecuted. Soon after he ceased teaching to recruit his strength, and after two years returned to Paris and found that his former teacher had removed to a monastery outside the city.

He again joined issue with him and gained so complete a triumph that he opened in Paris a school of rhetoric, the fame of which soon deprived all the others of their pupils. Shortly afterward he was appointed to his rival's chair in the cathedral school of Notre Dame, where he educated many distinguished scholars, among whom were the future Pope Celestin II, Peter of Lombardy, bishop of Paris, Berenger, bishop of Poictiers, Arnold of Brescia.

At this time there resided close to Notre Dame, a young lady, by name Héloïse, niece to the canon Fulbert, then of the age of 17, and remarkable for her beauty, genius, and varied accomplishments. Abelard became inspired with such violent love for Héloïse as to forget his duty, his lectures, and his fame. Héloïse was no less susceptible. Under the pretext of finishing her education he obtained Fulbert's permission to visit her, and finally became a resident in his house. His conduct in abusing the confidence which had been placed in him opened the eyes of Fulbert. He separated the lovers, but too late. Abelard fled with her to Brittany, where she was delivered of a son, who died early. Abelard now resolved to marry her secretly. Fulbert gave his consent, the marriage was performed, and in order to keep it secret Héloïse remained with her uncle, while Abelard retained his former lodgings and continued his lectures. Abelard, however, carried her off a second time and placed her in the convent of Argenteuil.

Fulbert erroneously believed it was intended to force her to take the veil, and under the influence of rage subjected Abelard to mutilation. He became, in consequence, a monk in the abbey of St. Denis, and Héloïse took the veil at St. Argenteuil. After time had somewhat moderated his grief he resumed teaching. At the Council of Soissons (1121), no defense being permitted him, his "Essay on the Trinity" was declared heretical, and he was condemned to burn it with his own hands. Continued persecutions obliged him at last to leave the abbey of St. Denis and to retire to a place near Nogent-sur-Seine, where he built a rude hut in which he determined to live a hermit's life. Even here, however, students flocked to him, and they built him an oratory, which he dedicated to the Holy Ghost and hence called Paraclete. Being subsequently appointed abbot of St. Gildas de Ruys, in Brittany, he invited Héloïse and her religious sisterhood, on the dissolution of their monastery at Argenteuil, to reside at the above oratory, and received them there. He lived for some 10 years at St. Gildas. Ultimately, however, he fled from it and lived for a time in other parts of Brittany.

Saint Bernard of Clairvaux, the leading opponent of the rationalistic school of Abelard, laid his doctrines before the Council of Sens in 1140, had them condemned by the Pope, and obtained an order for his imprisonment. Abelard appealed to the Pope, publishing his defense, and went to Rome. Passing through Cluny he visited Peter the Venerable, who was abbot there. This humane and enlightened divine effected a reconciliation between him and his enemies, but Abelard resolved to end his days in retirement. The severe penances which he imposed upon himself, together with the grief which never left his heart, gradually consumed his strength, and he died, a pattern of monastic discipline, in 1142, at the abbey of St. Marcel, near Châlons-sur-Saône. Héloïse begged his body and had him buried in the Paraclete, of which she was at that time the abbess, with the view of reposing in death by his side. Héloïse died there 16 May 1164. In 1800 the ashes of both were carried to the Museum of French Monuments at Paris, and in November 1817 were deposited under a chapel within the precincts of the church of Monamy. The small chapel, in the form of a beautiful marble monument, in which the figures of the ill-fated pair are seen reposing side by side, is now one of the most interesting objects in the Parisian cemetery of Père la Chaise.

Abelard was distinguished as a grammarian, orator, logician, poet, musician, philosopher, theologian, and mathematician. As a philosopher he founded an eclectic system commonly but erroneously termed Conceptualism, which lay midway between the prevalent Realism, represented in its most advanced form by William of Champeaux, and extreme Nominalism, represented in the teaching of his other master, Roscellin, and largely approached the Aristotelian philosophy. In ethics Abelard placed much emphasis on the subjective intention, which he held to determine the moral value as well as the moral character of man's action. Along this line his work is notable, owing to the fact that his successors did little in connection with morals, for they did not regard the rules of human conduct as within the field of philosophic discussion. His love and his misfortunes have secured his name from oblivion; and the man whom his own century admired as a profound dialectician is now celebrated as the martyr of love. Abelard's works were all written in Latin. They were first printed at Paris in 1616, are to be found in Migne, 'Patrologia Latina' (Vol. CLXXVIII, Paris 1855). Other editions of special works are 'Ouvrages inédits d'Abélard,' edited by Victor Cousin (ib., 1836); 'Opera' (2 vols., 1849–59); 'Sic et Non,' edited by E. L. T. Henke and G. L. Lindenkohl (Marburg 1851); 'Planctus Virginum Israel super filia Jeptæ Galaditæ,' edited by W. Meyer and W. Brambach (Munich 1886); 'Tractatus de Unitate et Trinitate,' discovered, edited, and published by R. Stölzle under the title, 'Abélards 1121 zu Soissons verurtheilter Tractatus, etc.' (Freiburg-im-Breisgau 1891); 'Hymnarius Paraclitensius,' edited by G. M. Dreves (Paris 1891). The letters of Abélard and Héloïse have been often published in the original and translations. Pope's epistle 'Eloisa to Abelard' is founded upon them. There is a complete English translation by J. Berington, with the Latin text, 'The History of the Lives of Abeillard and Héloïse' (Birmingham 1788), edited by H. Mills (London 1850). Consult also Wight, O. W., 'Lives and Letters of Abélard and Héloïse' (New York 1861); Morton, H., 'Love Letters of Abélard and Héloïse' (ib., 1901); Richardson, A. S., 'Abélard and Héloïse' (ib., 1884). Consult also Compayré, G., 'Abelard and the Origin and Early History of Universities' (New York 1893): Deutsch, S. M., 'Abälards Verurtheilung zu Sens, 1141, nach den Quellen kritisch dargestellt' (Berlin 1880); id., 'Peter Abälard, ein kritischer Theologe des zwölften Jahrhunderts' (Leipsic 1883); Hausrath, A., 'Peter Abälard' (ib., 1893); Hoyd, H., 'Abälard und seine Lehre in Verhältniss zur Kirche und ihrem Dogma' (Ratisbon 1863); McCabe, J., 'Peter Abélard' (New York 1901); Poole, R. L., 'Illustrations of the History of Mediæval Thought' (London 1884); Rashdall, 'Universities in the Middle Ages' (Oxford 1895); Rémusat, C. de, 'L vie re Pierre Abélard' (Paris 1855), the standard biography of Abélard; id., 'Abélard,' a drama (Paris 1877): Sauerland, H. V., 'Abälard und Héloïse' (Frankfort 1879); Thaner, F., 'Abälard und das canonische Recht' (Gratz 1900); Tiby, P., 'Deux convens au moyen âge, ou l'abbaye de Saint Gildas et le Paraclet au temps d'Abélard et d'Héloïse' (Paris 1851); Vacandard, E., 'Abélard, sa lutte avec Saint Bernard, sa doctrine, sa méthode' (Paris 1881); Wilkens, C. A., 'Peter Abélard' (Bremen 1851).

ABELIN, Johann Philipp, ä'bę-lĕn, German historian: d. about 1637 at Strasburg; was also known as JOHANN LUDWIG GOTTFRIED or GOTOFREDUS under which name he wrote 'Theatrum Europaeum,' a history of the world down to 1619, illustrated with Merian's beautiful copperplate engravings (21 vols., Frankfort 1633–1738); 'Historia Antipodum' (Frankfort 1635); and other works.

ABEN ESRA, ä'bĕn ĕz'rà, or IBN ESRA, properly Abraham ben Meir ibn Esra, Jewish scholar: b. Toledo, Spain, between 1093 and 1097; d. 23 Jan. 1167. While still a young man he traveled extensively and visited Italy, France, England and Egypt, but spent his later life in Rome. He was a profound scholar of the Hebrew, Arabic and Aramaic languages, as well as of mathematics, medicine, astronomy and philosophy, besides being a poet of no mean order. His most important work is his 'Commentaries on the Old Testament,' but he also wrote extensively on astrology, some of his treatises on that subject being published in Latin. His 'Isaiah' has been translated into English (London 1873), while his 'Canticles' appear in 'Miscellany of Hebrew Literature' (Vol. II, London 1877).

ABENSBERG, ä'bĕns-bĕrk, Germany, town in Bavaria, situated on the Abends, a branch of the Danube, 18 miles southwest of Ratisbon, with a population of 2,300. Its warm mineral springs have made it a health resort to a limited extent. On 20 April 1809 it was the scene of a battle between the French under Napoleon and the Austrians, whereby the former gained such advantages as lead up to their final victory at Eckmühl.

ABEOKUTA, ä'bĕ-ō-koo'ta, city in Egbaland, a division of Yoruba, on the Slave Coast, north of Lagos, with which it is connected by rail. The population is estimated at consider-

ably over a quarter of a million. It was founded some time in the third decade of last century by a combination of various local tribes as a mutual protection against the slavers, who raided this region extensively. The inhabitants are an industrious people, expert in various crafts, especially in building and textiles. A considerable trade is done between them and European traders, who exchange their goods for the products of the region, of which cotton is the most important.

ABERAVON, ăb'ėr-ā'vŏn, Wales, seaport town of Glamorganshire, near the mouth of the Avon on Swansea Bay, 11 miles by rail southeast of Swansea. It is the seat of the important metal industry of the vale of Avon with iron, steel, tin-plate, copper melting and engineering works. Pop. 11,000.

ABERCARN, ăb'ėr-kärn, England, a town of Monmouthshire, on the Great Western Ry. 10 miles northwest of Newport, with important coal and iron mines and allied manufactures. Pop. 17,000.

ABERCROMBIE, John, ăb'ėr-krŭm'bi, Scottish physician: b. Aberdeen, 10 Oct. 1780; d. 14 Nov. 1844. After graduating from the medical school in Edinburgh University, in 1803, he began a private practice in the city and soon was regarded as one of the leading consulting physicians of the country. His fame, however, rested mostly on his writings, and especially on his 'The Intellectual Powers and the Moral Feelings' (London 1833). Though possessed of no scientific value, his works were immensely popular on account of their readable qualities, their highly religious tone being especially acceptable to the people of his time. The estimation in which he was held by the nation may be judged by the many honors that were bestowed on him, among them being the degree of M.D. from Oxford, the rectorship of Marischal College, the vice-presidency of the Royal Society of Edinburgh and the office of physician in ordinary to the King for Scotland.

ABERCROMBIE, John William, American educator and congressman: b. Kelly's Creek, Ala., 17 May 1866. In 1886 he was graduated from Oxford College and, two years later, from the law school of the University of Alabama. He was appointed president of Ashland College after graduating from college and on completing his legal studies he became principal of Cleburne Institute, both Alabama institutions. For two years, from 1890 until 1892, he was president of Bowdon College, Georgia, after which he was for six years superintendent of schools in Anniston, Ala. For a while, during 1897, he was president of the Southern Female Seminary, now the Anniston College for Young Ladies, after which he was, for four years, superintendent of education for his native State. In 1902 he became president of the University of Alabama. From 1896 to 1898 he was a member of the State Senate, where he was chairman of the committee on education. From 1900 to 1904 he was a director of the National Education Association and from 1905 to 1906 he was president of the Southern Educational Association. In 1912 he was elected to Congress.

ABERCROMBY, David, Scottish philosopher: d. about 1702. His chief work is entitled 'A Discourse of Wit' (1686). He also wrote many treatises and his work is said to antedate the so-called Scottish School of Philosophy.

ABERCROMBY, or **ABERCROMBIE, James**, British soldier: b. Glasshaugh, Scotland, 1706; d. 1781. He is especially known as the commander of the 15,000 British troops who attacked Ticonderoga, 8 July 1758, being repulsed with a loss of 2,000 men. He obtained his commission in the British Army as major in 1742 and in 1756 was sent to America, being then a major-general. In September 1758, following his disastrous defeat at Ticonderoga, he was superceded in command by Sir Jeffery Amherst, whereupon he returned to England, became a member of Parliament and a firm supporter of the King's colonial policy. A full account of his career in America is given in Parkman's 'Montcalm and Wolfe' (Boston 1884).

ABERCROMBY, Sir Ralph, distinguished British soldier: b. Menstry, Scotland, October 1734; d. 28 March 1801. He was designed for the bar by his father and studied from 1752 to 1755 at the University of Edinburgh and the University of Leipsic. His natural inclination, however, was toward a military career, so in 1758 a cornet's commission was procured for him in the 3rd Dragoon Guards, with which regiment he went to Germany and saw some active service, as well as gained his first experience. After peace was concluded he was stationed in Ireland for some years, but in 1767 he married and retired to private life. In 1793 he accompanied the Duke of York to Holland, in which unfortunate campaign he was one of the few to distinguish themselves. On his return to England he was appointed chief-in-command of an expedition to the West Indies, which he conducted with marked success, capturing Demerara, Grenada, Essequibo and Trinidad. Soon after he was made commander-in-chief of the British forces in Ireland, but so obviously was he not in sympathy with the Government's policy of repression in that country that he was transferred to Scotland. In 1799 he was appointed second in command to the Duke of York in the expedition to Holland, another ignominious campaign, where Abercromby was the only one to conduct himself with distinction. On his return he was appointed to command the expedition to the Mediterranean. The fleet anchored in Aboukir Bay, 2 March 1801. On the 7th Abercromby reconnoitered the shore in person. The next day a landing was effected in spite of a heavy fire and within a few days the enemy was driven within his lines around Alexandria. On 21 March Menou attempted to surprise the British camp; a terrible battle followed, in which the British forces were completely victorious, but Abercromby had been mortally wounded by a musket ball which caused his death some days later. The gratitude of the nation for his services took the form of a peerage, granted to his widow and afterwards enjoyed by his son, with the title of Baron Abercromby.

ABERDARE, ăb'ėr-dār', Wales, a town of Glamorganshire, at the junction of the rivers Cynon and Dâr, and on the Great Western Railway, four miles southwest of Merthyr Tydril. It is an important coal-mining centre.

with iron and tin-plate works, brickworks and breweries. Pop. 51,000.

ABERDEEN, 4TH EARL OF (GEORGE HAMILTON GORDON), British statesman and premier: b. Edinburgh, 28 Jan. 1784; succeeded to title in 1801; d. London, 14 Dec. 1860. He was educated at Harrow and St. John's College, Cambridge. Shortly after returning from a Continental and Grecian tour, full of classical enthusiasm, he established the Athenian Society; whence Byron's sneer

> " First in the oat-fed phalanx shall be seen,
> The traveled thane, Athenian Aberdeen."

He severely criticized Gell in the *Edinburgh Review* and wrote an introduction to Wilkins' translation of Vitruvius, published separately in 1822 as 'An Inquiry into the Principles of Beauty in Athenian Architecture.' In 1806 he entered Parliament as a Scottish representative peer, and was twice re-elected. In 1813 he was sent to Austria to bring it into the coalition against Napoleon, and in 1814 was a signatory of the Treaty of Prague; he won credit in diplomacy, and the same year was made Viscount Gordon in the British peerage. During 1815–28 he devoted himself to his estates. In 1828 he became chancellor of the Duchy of Lancaster, and a few months later foreign secretary in Wellington's Cabinet, and had the satisfaction of seeing Greek independence recognized. He warmly supported repeal of the Test and Corporation Acts, and Catholic Emancipation. Peel had him in both his Cabinets, 1834–35 as colonial secretary, 1841–46 as foreign secretary. In 1846, during the struggle which rent the Established Church of Scotland in twain, he brought in a compromise bill which was denounced by both halves; and after the Disruption in 1843 again attempted conciliatory measures without result. On Peel's death in 1850 he became the leader of the free-trade Conservatives. The Derby administration being unable to stand, Lord Aberdeen in 1853 formed a coalition ministry. In it were such men as Russell, Palmerston and Gladstone. For a time it was very popular; unluckily the Crimean War supervened. Aberdeen's tardiness of action and reluctance to enter on hostilities, the result of a constitutional aversion to war, irritated the country, which was in one of its periodical anti-Russian frenzies, and bent on fighting. Moreover, the early portion of the war was shockingly mismanaged, as those of commercial countries always are; and on the appointment of a committee of inquiry, the ministry, which had uniformly resisted the motion, resigned, and Palmerston's succeeded it. This closed Aberdeen's public life. His dislike to "spirited" foreign policies and interference with other countries, and his sympathy with the Holy Alliance, gave him the name of an enemy to liberty; but the above detail shows its injustice. Consult Gordon 'Earl of Aberdeen' (London 1893).

ABERDEEN, John Campbell Hamilton Gordon, 1ST MARQUIS OF: b. 3 Aug. 1847. He succeeded his brother as 7th Earl of Aberdeen in 1870; was lord-lieutenant of Ireland, 1886, 1905–15; and governor-general of Canada, 1893–98. He was created a Marquis in 1915. ISABEL MARIA, Marchioness of Aberdeen, wife of above, is the youngest daughter of Dudley Coutts Majoribanks, 1st Baron Tweedmouth and a prominent banker. She was b. Inverness-shire, Scotland, 1857. At an early age she became interested in social and political work, has been especially prominent in organizations which have as their object the raising of the status of women, and has held the office of president of the International Council of Women. Her literary works are: 'Through Canada with a Kodak'; 'Our Lady of the Sunshine' (1910); 'Ireland's Crusade against Tuberculosis' (1908).

ABERDEEN, Miss., city and county-seat of Monroe County; on the Tombigbee River, and the Illinois Cent., the St. L. & San F., and the Mobile & O. railroads; 130 miles southeast of Memphis, Tenn. Its chief trade and manufacture are cotton and cotton products, lumber coming next. There are also oil and grist mills and manufactures of clothing, buttons, barrel-staves, wagon spokes, etc. The waterworks and electric light plant are owned by the city. Pop. (1910) 3,708; (1917) 4,500.

ABERDEEN, S. D., city and county-seat of Brown County, on the Chicago & N. W., Chicago, Milwaukee & St. Paul, the Minn. & St. L., and Great Northern railroads; 280 miles west of Minneapolis, 125 miles northeast of Pierre. It is the farming and lumber trade centre of a large section; manufactures boots and shoes, flour and feed, soap, plows, machinery, chemicals, soft and pressed brick, clothing, candy, and artesian well supplies, etc., and has 10 grain elevators, granite and marble works and creameries. Its factories are supplied with abundant water power furnished by artesian wells. It has Federal and municipal buildings, a court house, an opera house, five inside parks, national banks, several daily, weekly and monthly periodicals, a system of graded public schools and a State normal and industrial school, a Carnegie library. The value of taxable property is $13,669,100. Aberdeen was settled in 1880, inc. 1882 and was one of the first cities to adopt commission government. Pop. (1910) 10,753; (1917) 14,760.

ABERDEEN, Wash., city in Chehalis County, at the head of Grays Harbor, on the Chehalis River, 50 miles west of Olympia, and on the Northern Pacific, the Chicago, Milwaukee and St. Paul, and other railroads. It is a lumber and dairy centre. The city has logging, lumber and shingle mills, cooperages, shipyards and fish-curing houses. There is steamship communication with the Pacific ports. The waterworks are the property of the city. Pop. (1910), 13,660; (1917) 18,300.

ABERDEEN, Scotland, the chief city and seaport in N. Scotland, fourth largest in all Scotland; lies in Aberdeenshire, of which it is the county town, between the mouths of the Dee and Don rivers, 130½ miles northeast of Edinburgh by the N. British Railway, also on the Caledonian N. Scotland Railway. William the Lion gave it a charter in 1179; and its privileges were subsequently extended by Robert Bruce. The English burned it in 1336, but it was soon rebuilt; within the same parliamentary boundary is a small town a mile north near the Don mouth, formerly called Old Aberdeen, the seat of St. Marchar's Cathedral (1357–1527),

now represented by the granite nave, which, as restored since 1869, is used as a parish church. King's College and University, founded by Bishop Elphinstone in Old Aberdeen in 1494, and Marischal College and University founded by the Earl Marischal in New Aberdeen in 1593, were in 1858 united into one institution, The University of Aberdeen (q.v.). With Glasgow University it sends one member to Parliament. Marischal College was rebuilt in 1841 and additions were made in 1895 and 1906. Kings College is a stately fabric, its chapel, dating from 1500, is adorned with exquisite wood-carvings. The university is richly endowed by the State and private bequests and is a beneficiary of the Carnegie Trust Fund. In the 17th century Aberdeen had become an important place, but it suffered much from both parties in the civil wars. It has a flourishing trade and thriving manufactures; and having been largely rebuilt of granite and extended since the formation of Union street in 1800, the "Granite City" now offers a handsome and regular aspect. Among the chief public edifices are the Municipal and County buildings, the post-office, Market Hall, Trades Hall, the Royal Infirmary, the lunatic asylum, the Grammar school, the art gallery and art school, the music hall, public library, College of Agriculture and Gordon's College. The last has been much extended as a technical school, the foundationers being no longer resident; while the infirmary was reconstructed and modernized to celebrate the Queen's Jubilee (1887). Of more than 60 places of worship those of most interest are built on the site of the ancient church of St. Nicholas, connected by a granite tower where a fine carillon of 37 bells was placed in 1887, and a Roman Catholic Cathedral built in 1859, with a spire 200 feet high. One may also notice the Market-cross (1686), the Wallace, Gordon Pasha, and three other statues, the Duthie public park of 47 acres, Victoria Park, Union Terrace, and the four bridges spanning the River Dee, one of which is said to date from 1320. It has a fine harbor and docks, good steamship and railway facilities and does a large import and export trade, being the leading port for the White Sea and Baltic trades. The chief exports are woolens, linens, cotton yarns, paper, combs, granite (hewn and polished), cattle, grain, preserved provisions and fish. Aberdeen is one of the most important fish-trawling centres and has the largest granite polishing works in the kingdom, the art of granite polishing having been revived here in 1818 by Alexander McDonald. There are also several large paper works nearby. Shipbuilding was formerly a prosperous industry, the Aberdeen clipper-bow ships being celebrated as fast sailers, but now is greatly contracted. The city sends two members to Parliament and is under the jurisdiction of a council with lord provost, bailies, treasurer and dean of guild. Pop. (1901) 153,503; (1911) 163,084.

ABERDEEN, University of, Scotland, situated in the city of Aberdeen, and consisting of King's and Marischal Colleges. The former was at one time known as St. Mary and was founded in 1494 by William Elphinstone, Bishop of Aberdeen. Marischal College was founded in 1593 by George Keith, Earl Marischal of Scotland. Until 1858 the two institutions were under separate government, when they were united into the University of Aberdeen by an act of Parliament. The students number from 1,200 to 1,300 and include both sexes. The faculties, five in number, covering arts, law, science, theology and medicine, number fully 30 professors and as many instructors. Endowments are both state and private, beside which the institution is also a beneficiary of the Carnegie Trust Fund. Its library has over 140,000 volumes.

ABERDEEN ACT (Brit.), introduced by the Earl of Aberdeen, and passed in 1845, to enforce the observance of a convention made with Brazil in 1826 to put down the slave trade. The act was repealed in April 1869.

ABERDEENSHIRE, Scotland, the northeasternmost county, on the North Sea, drained by the rivers Don, Ythan and Dee. Aberdeen, the capital, Peterhead and Fraserburgh are the chief towns. Area, 1,971 square miles; pop., 312,200.

ABERIGH-MACKAY, ä-bĕ'rĭ-măc'kā, **George Robert,** Anglo-Indian teacher and author: b. 25 July 1848; d. 1881. In 1877 he became principal of Rajkumar College, Indore, and widely known by his attractive satire on Anglo-Indian society, 'Twenty-one Days in India' (London 1878–79).

ABERNETHY, John, Irish dissenting clergyman and pioneer of toleration: b. Coleraine, 19 Oct. 1680; d. 1740. The son of a Nonconformist minister, he graduated successively from Glasgow and Edinburgh universities, was licensed to preach before coming of age, urged to take an important charge in Antrim at 21, and two years later was ordained there. The work he did there for many years was of the most remarkable kind, in drafts on body, brain, soul and will; and he was eminent in all. In 1717 he was invited at once to Dublin and Belfast; the Synod assigned him to Dublin; he refused to leave Antrim and was considered a Church mutineer; a furious quarrel followed, developing into the fight in the Irish Presbyterian Church between "subscribers" and "non-subscribers" (Abernethy's party), the latter being formally barred out in 1726. The real question at issue was of old orthodoxy versus the liberalizing opinions which he disclaimed holding, but which have of course long since left his position far behind. In 1730 he was nevertheless called to Dublin. The next year came up the question of the Test Act, really involving the whole subject of religious tests in civil life; and Abernethy took a firm stand against "all laws that, upon account of mere differences of religious opinion and forms of worship, excluded men of integrity and ability from serving their country," asserting near a century ahead of his time that a Roman Catholic could be such. His 'Tracts' were later collected, and did good service in the Catholic Emancipation fight of the next century. Abernethy was the bravest of the brave, not only in advocating unpopular truths to his own harm, but in resisting the highest dignitaries in the cause of right. Consult 'Diary,' 6 vols.; Duchal's 'Life', 'History of Irish Presbyterian Church.'

ABERNETHY, John, English surgeon, grandson of the preceding: b. London, 3 April 1764; d. 20 April 1831. Educated at Wolver-

hampton grammar school, he was apprenticed at 15 to Sir Charles Blicke, a leading London surgeon, assistant surgeon at St. Bartholomew's Hospital; he also attended the lectures of Pott, the chief surgeon there, of John Hunter, and the anatomical lectures at London Hospital of Sir William Blizzard, who early employed him as demonstrator. Pott resigning, Blicke took his place, and made Abernethy assistant surgeon in 1787. His lectures, illustrated by apt anecdotes, drew such crowds that a special building was erected, now the celebrated St. Bartholomew's School. In 1813 he was appointed surgeon to Christ's Hospital, in 1814 professor of anatomy and surgery to the College of Surgeons, and in 1815 full surgeon to St. Bartholomew's, a post which he resigned in 1829. Of his numerous medical works the most important is 'Surgical Observations on the Constitutional Origin and Treatment of Local Diseases' (1806), which, from his frequent references to it, became known as 'My Book.' He was one of the first to prove that topical symptoms should be treated by general remedies, especially for the stomach and bowels; and he was a persuasive and influential teacher, though over-dogmatic. He was the first to introduce the capital surgical improvement of tying the great arteries in operations for aneurism, etc. Consult 'Works' (5 vols., 1820); 'Memoirs' by Macilwain (1853), not highly esteemed.

ABERRATION. In physics, (1) that property of a lens or curved mirror in virtue of which it does not form a sharp, flat image devoid of false color fringes. Spherical aberration is the geometrical distortion of the image due to the fact that the surface of the lens or mirror is spherical instead of having the theoretically best form. It is easy to grind a spherical surface, and more difficult to grind those of other forms; hence in the practical manufacture of a high-grade lens the curvatures are carefully calculated, so that spherical surfaces may be used, while the spherical aberration is still kept within limits that are consistent with the use of the lens. (See LENS.) Chromatic aberration is the defect in virtue of which the focal length of the lens is not the same for all colors. A lens possessing chromatic aberration gives an image that is blurred with rainbow-like fringes; one that is devoid of chromatic aberration is said to be achromatic (see LIGHT). Mirrors, whether concave or convex, have no chromatic aberration.

(2) The slight displacement of the apparent position of a star or other celestial object, due to the fact that although the velocity of light is very great it is not infinite. In recent years much attention has been paid to aberration phenomena, because the observed amount of the displacement of a star indicates that the ether of space is stationary and that the earth passes through it like a fish through stagnant water; while direct experiments indicate, on the contrary, that the ether is dragged along with the earth to a considerable extent. See ETHER; RELATIVITY, THEORY OF.

AB'ERT, Herman Joseph, German authority on music: b. Stuttgart, 25 March 1871. His first musical education was from his father, who was director of the court opera, but later he studied in the Stuttgart conservatory. From 1890 to 1895 he was a student in the University of Tübingen, where he specialized in classical philology, thereby earning his degree of Ph.D. In 1897 he entered the University of Berlin and for four years there devoted himself to research work into the history of music. In 1902 he was appointed lecturer of music at the University of Halle, where he was appointed professor in 1909. His works are: 'Die Lehre von Ethos in der griechischen Musik' (1899); a biography of Schumann in Reimann's series 'Berühmte Musiker' (1903); 'Die Musikanschauung des Mittelalters und ihre Grundlagen' (1905); 'Jommelli als Opernkomponist' (1908).

ABERT, John James, American military engineer: b. Shepherdstown, Va., 17 Sept. 1788; d. 1863. He was graduated at West Point in 1811, was admitted to the bar; served in the War of 1812, becoming topographical engineer with the rank of major; was made chief and colonel of topographical engineers in 1838, and assisted in developing important canals and other works. His engineering reports are considered standard, and he was a founder of the National Institute of Science, since merged in the Smithsonian. He was retired in 1861 and was an important factor in the development of governmental engineerings in the earlier half of the 19th century.

ABERYSTWITH, ăb'ĕr-ist'with, Wales, a popular seaside resort of Cardiganshire, on Cardigan Bay 50 miles by rail northeast of Swansea. The pier and attractive sea front promenade and the buildings of the University College of Wales on Castle hill near the picturesque ruins of the 11th century Norman castle are prominent features. Pop. 8,500.

ABEYANCE, meaning expectancy; probably derived from the French *bayer,* to gape after. When real or personal properties are in expectation, or the intendment of the law, they are said to be in abeyance, or not actually possessed. The word is often used in the Church of England, a living being known as "in abeyance" when it is left vacant owing to the unwillingness of the patron to declare himself in favor of any particular applicant for the office.

AB'GAR, Kings of Edessa, northern Mesopotamia, chiefly remembered from the 3d century account by Eusebius Pamphilius of one of them, Ouchama—"the black," probably Abgar V, who, suffering from leprosy, wrote a letter to Jesus asking him to come to Mesopotamia to heal him. Eusebius states that Jesus wrote a letter in reply that he was unable to make the journey, but that after his ascension he would send a disciple. Eusebius says that he both saw and transcribed his account from the original letters at Edessa and that Judas, son of Thaddeus, one of the 70 disciples was sent, A.D. 29. Moses of Chorene further states that Jesus sent his portrait to Abgar. Portraits now exhibited both at Rome and Genoa are claimed to be this original portrait, known as "The Holy Face of Edessa."

ABHEDANANDA, Swâmi, ăb'-ha-dā'nandâ, Hindu author and lecturer: b. Calcutta, India, 21 Nov. 1866. He was graduated from the University of Calcutta and afterward became a disciple of Râmakrishna Paramahansa and a member of the Order of Sanyâsins, a very ancient priesthood. He came to this country in 1897 to lecture on the Vedanta philosophy, organizing and becoming head of

the Vedanta Society in New York city. He has lectured extensively before educational institutions and societies throughout the United States and is considered the best authority on Monistic Vedanta. His chief works are: 'Reincarnation' (1899); 'Spiritual Unfoldment' (1902); 'Philosphy of Work' (1902); 'How to be a Yogi' (1902); 'Divine Heritage of Man' (1903); 'Self-Knowledge' (1905); 'India and Her People' (1906); 'Human Affection and Divine Love' (1911); 'Great Saviours of the World' (1911).

ABHOR'RERS, a term applied in English history by the PETITIONERS, their opponents, to those tories who expressed abhorrence of the petitions to Charles II in 1679 to reassemble Parliament, and upheld him in his autocratic efforts to control public opinion.

ABI'ATHAR, high priest of the Jews, son of Ahimelech who was killed by Saul's command because he had assisted David. Abiathar also became one of David's most loyal adherents and supported him during the rebellion of Absalom. Solomon cast him out of the priesthood when he supported Adonijah and banished him to Anathoth.

A'BIB, first month of the Jewish ecclesiastical year and the seventh of the civil year, the month in which the Passover is celebrated. This month is now called Nisan, a name which was adopted during the Babylonian period of the history of the Jewish people and as such it is now known in the official calendar of the Jewish Church.

ABICH, Wilhelm Herman, German mineralogist and naturalist: b. Berlin, 11 Dec. 1806; d. Graz, 2 July 1886. After completing a course of study in the natural sciences at the University of Berlin, he traveled in Italy and Sicily. In 1842 he was appointed to the chair of mineralogy in the university at Dorpat, and in 1853 was elected a member of the Academy of Sciences in Saint Petersburg, for whom he wrote exhaustive reports of the explorations which he had made in the Caucasus, Russian Armenia and northern Persia. He also published several books descriptive of the minerals found in the different countries in which he had traveled, the most important of which are: 'Erläuternde Abbildungen von geologischen Erscheinungen, beobachtet am Vesuv und Aetna 1833 und 1834' (1837); 'Ueber die Natur und den Zusammenhang der vulkanischen Bildungen' (1841); 'Ueber die geologische Natur des armenischen Hochlander' (1843); 'Ueber die Natronseen auf der Araxesebeni' (1846–49); 'Vergleichende geologische Grundzüge der kaukas-armenischen und nordpersischen Gebirge' (1858); 'Sur la Structure et la Géologie du Daghestan' (1862).

AB'IGAIL, or **AB'IGAL**, wife of King David, but previously the wife of Nabal. She offered food to David while he was fleeing from Saul, after her husband had refused to do so. When Nabal died, some 10 days later, David took her to wife. During a foray of the Amelikites on Ziklag, Abigail was carried off, but David recovered her. She bore him a son, Chileab, or Daniel. Another Abigail was daughter of Nahash, sister of Zemiah, Joab's mother, wife of Ithro, the Ishmaelite, mother of Amasa. The name is also employed as a general name for waiting maids.

ABIJAH, or **ABIAH**, also **ABIJAM**, the name of nine different persons mentioned in the Old Testament. (1) The second King of Judah, son and successor of Rehoboam. He was presumably a great-grandson of David on his mother's side, for she is described as a daughter of Absalom, though there is some confusion regarding both mother and son in the text. In the books of Kings and Chronicles she is variously given as Maacah, daughter of Abishalom, and Micaiah, daughter of Uriel of Gibeah. It may be noted that Maacah was also the name of Asa's mother. All we can gather is that Abijah reigned three years, that he walked in all the sins of his fathers, and was at war with the King of Israel, Jeroboam. (2) The second son of Samuel bore the name of Abijah or Abiah, likewise (3) a young son of Jeroboam I, while another Abijah was one of the "heads of fathers' houses" of the sons of Eleazar, eponymist of the 8th course of priests, to which Zacharias, the father of John the Baptist, belonged. In the lists of priests the name Abijah occurs in Nehemiah x and xii; in 1 Chron. it applies also to the wife of Hezron, eldest son of Perez; a son of Becher, son of Benjamin; and the mother of Hezekiah, also called Abi.

ABILDGAARD, Nikolai Abraham, Danish painter: b. Copenhagen, 4 Sept. 1744; d. Frederiksdal, 4 June 1809. He studied for some time at the academy in Copenhagen, but in 1772 went to Rome to study under the masters. After his return he was appointed to a professorship at the academy in 1786, and in 1789 was elected a director. The greater number of his paintings were of an historical nature and he had much to do with the founding of the Danish school of historical painting. A series of 10 pictures in the castle of Christiansborg, which burned in 1794, and scenes from Shakespeare and Ossian were his most important works.

ABILENE, ab'ĕ-lĕn, Kan., city, county-seat of Dickinson County 163 miles west of Kansas City, on the Smoky Hill River and Union Pacific, Chicago, R. I. & P. and Atchison, T. & S. F. railroads. For many years it has been one of the great agricultural market centres of the State, the focus of a large farm loan business, and the sales-ground and shipping point for large droves of cattle that are annually brought from Texas. It has also large manufacturing interests, including several flour-mills and creameries, as well as manufacturers of iron bridges, carriages, etc. Mineral water from sand springs four miles distant is bottled for export. These springs also supply the water works which are owned by the city. There are four banks, with a combined capital of $175,000; one high school and three ward schools, many fine private residences, a city hall, court house, Government building and Carnegie library. The value of taxable property is $4,718,628. Abilene was settled in 1856, incorporated in 1869, the original charter remaining in force until 1911 when the commission form of government was adopted. Pop. (1910) 4,118; (1917) 5,000.

ABILENE, Tex., city and county-seat of Taylor county 160 miles southwest of Fort Worth, on the Texas & P., Wichita Valley and Abilene & S. railroads. It is the centre

of a farming, cotton, fruit and stock-raising district and its chief interests lie in its cotton gins, oil, compress and flouring mills and oil refineries. It has three national banks, with deposits amounting to about $3,000,000; four ward schools and one high school, and is the seat of Christian College (Baptist), Simmons College and the State Epileptic Colony. There are seven churches and among other buildings worthy of note are the post-office, Carnegie library and Federal court house. The value of taxable property is $6,000,000. The city is supplied with natural gas from Moran, Tex., and has electric light and water plants and a good street railway system. A high tension electric line runs to Merkel, Tex., on the west. The government is the commission form, vested in a mayor and four commissioners. Receipts and expenses balance at approximately $80,000. Pop. (1910) 9,204; (1917) 14,000.

ABIMELECH, a-bĭm'ĕ-lĕk, "Melech is father," or "father is king." (1) King of Gerar, who, according to Gen. xx, took Abraham's wife, Sarah, into his harem, but restored her, afterward entering into a covenant with Abraham. There are two variations of the same story. (2) The son of Gideon. After his father's death he caused his 70 half-brothers to be slain and was proclaimed king. Three years later he crushed a revolt headed by Gaal, son of Ebed. Abimelech was mortally wounded by a woman during his attack on Thebez. Judges viii, ix; 2 Samuel xi.

ABINGDON, Ill., city, Knox County 85 miles northeast of Quincy, on the Chicago, B. & Q. and the Minn. & St. L. railroads. Settled 1828, incorporated 1857, now acting under charter of 1859. Among its many industrial interests, which include wagon-works, saw-mills and manufactories of gloves, shirts and overalls, cement, paving brick, tile and organs, it has the largest animal-trap factory in the world. It is in an agricultural region and possesses some coal mines. Besides its excellent school system, it is the seat of Hedding College (M. E.) and Abingdon (Christian) College, the latter having been founded in 1855. A mayor and council of five are annually elected. Pop. (1917) 3,000.

ABINGDON, Va., town and county-seat of Washington County, on the Holston River and the Norfolk & W. and the Virginia-Carolina railroads, 315 miles southwest of Richmond and 189 miles west by south of Lynchburg. Settled 1730, incorporated 1788, it has long been noted for its large tobacco and live-stock interests, as well as for its valuable deposits of iron, gypsum and salt, much of the salt used in the Southern States during the Civil War having been obtained in this vicinity. Its manufactures include wagon-works and planing-mills, besides cigar, tobacco, pipe, brick and canning factories. It is also the seat of Martha Washington College for girls (Methodist Episcopal, South), the Stonewall Jackson Female Institute (Presbyterian), the Academy of the Visitation and Abingdon Academy for boys. Pop. (1917) 1,760.

ABINGTON, Mass., a post township in Plymouth County 19 miles north of Plymouth and 19 miles southeast of Boston, on the Plymouth Branch of the New York, N. H. & H. Railroad and Old Colony electric. Settled in 1680, incorporated 1712. Its southern portion is now known as Whitman; its northern portion as North Abington, and both are important manufacturing centres, the chief industries being the making of boots and shoes, shoe findings, lasts, textile machinery, window shades and dry plates. Strawberry growing is also practised and there are good nurseries. Abington has three banks with a combined capital of $3,924,866; commodious and well-kept elementary and high schools, for which an annual appropriation of $37,200 is made, a good fire department, municipal owned water works and a fine park with an arch to Civil War veterans. The value of taxable property is $3,763,645. The government is by town meeting. In 1915 the treasurer's reports totaled $240,035. The Abolitionist movement was started and encouraged by meetings in Island Grove in this town. Pop. (1910) 5,455; (1915) 5,646. Consult Hobart, B., 'History of the Town of Abington' (Boston 1866).

ABIOGENESIS. See BIOGENESIS.

ABIPONE, ä'bē-pō'nā, an Indian tribe, formerly inhabiting the Gran Chaco region of Paraguay, the headwaters of the Rio Grande in Bolivia and the Vermejo in Argentina. They were daring riders and fierce and formidable antagonists of the Spaniards, their weapons being the bow and the lance. In 1780 the tribe numbered about 5,000, but owing to a peculiar custom prevalent among them, whereby all but two children of a family were killed off, as well as to the constant wars with the Spaniards, this whole people has become extinct. Consult Dobrizhoffer, 'An Account of the Abipones' (London 1822); Church, Aborigines of South America' (London 1912).

ABITIBI, ăb'ĭ-tĭb'ĭ, Canadian river and lake, the latter being situated in latitude 48° 24' N. at an elevation of 830 feet. Out of the lake flows the river of the same name, northward to James Bay, in Hudson Bay.

ABJURA'TION, the act of forswearing, abjuring or renouncing upon oath; a denial upon oath; a renunciation upon oath. Chiefly a law term and used in the following senses:

1. In the United States when an alien wishes to become a citizen he must declare, among other things, that he doth absolutely and entirely renounce and *abjure* all allegiance and fidelity which he owes to any foreign sovereign, etc., and especially by name the sovereign, etc., whereof he was before a citizen or subject.

2. An abjuration of the realm. During the Middle Ages the right of sanctuary was conceded to criminals. A person fleeing to a church or churchyard might permanently escape trial if, after confessing himself guilty before the coroner, he took an oath abjuring the kingdom: promising to embark, at an assigned port, for a foreign land, and never to return unless by the king's permission. By this, however, he forfeited his goods and chattels.

3. Special. An abjuration or renunciation of all imagined allegiance to the Jacobite line of rulers, after the English nation had given its verdict in favor of William and Mary.

The oath of abjuration was fixed by 13 Wm. III c. 16. By the 21 & 22 Vict. c. 48, one form of oath was substituted for the oaths of

allegiance, supremacy and abjuration. For this form another was substituted by the Act 30 & 31 Vict. c. 75, § 5. This has in turn been superseded by the Promissory Oaths Act, 31 & 32 Vict. c. 72.

4. An abjuration, renunciation or retraction of real or imagined heresy or false doctrine. Thus the now abolished 25 Chas. II c. 2, enacted that certain tenets of the Church of Rome were to be solemnly renounced.

ABKHASIA, ăb-kā'sē-ą, or **ABASIA,** a district of European Russia, in the government of Kutais, Trans-Caucasia. It extends down the southern slopes of the Caucasus Mountains to the Black Sea. The country is extremely mountainous and heavily timbered, mostly with oak and walnut. The inhabitants, numbering 136,500 in 1917, are mostly Mingrelians and Abkhasians and are engaged mainly in agriculture and stock-rearing, as well as in the cutting of lumber. The district, which is about 2,500 square miles in area, has been successively under the dominion of the ancient Persians, the Georgians and the Turks, the latter establishing the religion of Islam among the people. After the Treaty of Adrianople, in 1829, the Russians began establishing themselves there, but they did not gain full possession until 1864. The chief town is Sukhum Kale.

ABLATIVE CASE, one of a number of "cases" comprising a system of modifications which nouns, pronouns and adjectives undergo in many languages, the number of cases being very different in different languages. The further back we go in the history of the Indo-European languages, the richer we find them in these modifications. Sanscrit has eight cases, Latin six and Greek five. The Latin cases, often used in regard to the English language, are: the Nominative, which names the subject; the Genitive, expressing the source whence something proceeds; the Dative, that to which something is given; the Accusative, the object toward which an action is directed; the Vocative, the person addressed, or called; and the Ablative, that from which something is taken, denoted in English by means of the prepositions *in, with, by, from,* etc.

AB'LEGATE, papal envoy, or special commissioner, representing the papal court at Rome in conveying the hat and the red biretta to a newly appointed cardinal. Upon delivering the insignia of office his mission is completed. There are two ranks of ablegates: the apostolic and the pontifical, the former outranking the latter.

ABLUTION, or the ceremonial act of washing to symbolize purification from uncleanness, is a rite which has been observed by many races of people from the early Mosaic days down to our own time. Under the Mosaical dispensation the act of ablution had four purposes: (1) To cleanse from the taint of an inferior position before initiation into a higher state, as when Aaron and his sons, having been chosen for the priesthood, were washed with water before they were invested with their robes of office; (2) to cleanse in order to fit one for special acts of religious ceremony, as when the priests were required, under the penalty of death, to wash both their hands and feet before approaching the altar; (3) to cleanse from defilement contracted by some particular circumstance which prevented one from enjoying the privileges of ordinary life, of which there were no less than 11 species of uncleanness recognized by the law; and (4) to cleanse or absolve oneself from the guilt of a particular act, as when, in expiation for an unknown murder, the elders of the village washed their hands over the slaughtered heifer, saying, "Our hands have not shed this blood, neither have our eyes seen it" (Deut. xxi). This practice was also common both among the Greeks and Romans, and it was undoubtedly in accordance with this practice that Pilate called for water and washed his hands to signify that he held himself innocent of the blood of Jesus Christ (Matt. xxvii, 24).

Ablution by the priests before the performance of sacred ceremonies was common even among the heathen, while the Egyptian priests carried the practice to such an extreme that they shaved their entire bodies every third day and then washed themselves in cold water twice every day and twice each night, that no particle of filth might even rest upon them. Such an act corresponds somewhat to the more simple *wadu* of the Mohammedans, a ceremonial washing which they are compelled to observe five times daily, or immediatelv before their stated prayers, and these do not begin to represent the formal acts of cleansing required by the Moslem law. For example, the ablution for positive defilement required by Moses has its counterpart in the Mohammedan *ghual,* and yet again, under the Moslem law, the causes of such defilement are specified so minutely that they greatly exceed those of the ancient Jews. So strict was the law upon this point, however, that, when water could not be obtained, it was required that the purification should be made with something that might represent the water. In times of drought, therefore, or on occasions of sickness, the act of purification might be performed by rinsing, or rubbing the hands and face with dry sand. This form of cleansing was called *tayemmum.*

The ceremony of ablution at communion was adopted by the early Christian Church, and has been retained both in the Eastern and Roman Catholic churches. In the Roman Catholic Church it has become a liturgical term, denoting the two acts of cleansing performed during the mass: (1) When wine is poured into the chalice to disengage any particles which may be left in the vessel; and (2) when both wine and water are poured over the priest's fingers into the chalice. In the Greek Church the word "ablution" is applied to a ceremony performed seven days after baptism, when the unction of the chrism is formally washed off from those who have been baptized.

ABNAKI, ăb-nā'kē, a federation of the Algonquin Indians, including the Passamaquoddies, the Penobscots, Norridgewocks and other minor tribes, formerly occupying a territory now included in Maine and southern New Brunswick. As a result of King Philip's war they assisted the French colonists against the English, until the latter destroyed their principal town at Norridgewock and killed their missionary, Rasle, in 1724. Thereafter the greater portion of them removed to Saint Francis, Canada. Those who remained behind made peace terms with the English and

were allowed to retain a smaller portion of their old territory. Their descendants, now numbering only about 1,500, are found in the Malecites on the Saint John River, New Brunswick, the Passamaquoddies on the bay bearing their name, in Maine, the Penobscots, at Oldtown, Me., and the Abnakis at Saint Francis and Bécancour, Quebec.

AB'NER, son of Ner and cousin of Saul and commander of the latter's army. When the tribe of Judah recognized David after Saul's death, Abner prevailed upon the other tribes to recognize Saul's son, Ishbaal. Whereupon David sent his forces, under the command of Joab, into the field. Abner met them at the pool of Gibeon and attempted to terrify Joab's men by a ruse. He proposed that 12 champions from each army should engage in a competitive trial of strength. Abner's 12 men were Benjaminites and left-handed, so that they could conceal short swords at their right sides. By this trick the Judæans were killed. Whereupon the angry soldiers of Joab fell on Abner's men and drove them from the field. Abner fled, but being closely pursued by Asahel, he turned and slew him. Later Abner quarrelled with Ishbaal and went over to David. But Joab had not forgotten the death of Asahel, his brother, and while Abner was peacefully dining with David he killed him. The murder caused general indignation, but Joab's high position as commander of the army saved him from punishment.

AB'NEY, Sir William de Wiveleslie, English astronomer and physicist: b. Derby, 24 July 1844. He was graduated from the military academy at Woolwich in 1861 and entered the Royal Engineers as a lieutenant, reaching the rank of captain within 10 years. From 1893 to 1895 he was president of the Royal Astronomical Society, after which, for two years, he was president of the Physical Society of London. In 1903 he became adviser to the Science and Art Department of the Board of Education. In the same year he became a member of the Advisory Council for Education to the War Office. His reputation rests largely on his researches in photography and spectroscopy, on which he has written many works, the most important of which are: 'Instruction in Photography' (1870); 'Treatise on Photography' (1875); 'Color Vision, Color Measurement and Mixture' (1893); 'The Pioneers of the Alps' (with C. D. Cunningham, 1888). In 1900 he was awarded a knighthood.

ABNORMAL PSYCHOLOGY. See Psychology of the Abnormal.

ABO, â'boo, former capital and the oldest city of Finland, now the chief town of the government of Abo-Björneborg. It is situated on the Aurayoki River and near the Gulf of Bothnia, 128 miles in a westerly direction from Helsingfors. It was founded by the Swedes in 1157 and remained the capital of Finland until 1819. It contains a fine sarcophagus which was erected in 1865 in memory of the Queen, Catharine Monsdotter, who died in 1512. In one of the suburbs is an old spring in which, according to traditions prevalent among the people, the Finns were first baptized into Christianity. It is in direct steamship communication with Stockholm, Copenhagen and Petrograd. Its harbor is too shallow to allow shipping of more than 10 feet draught, so large vessels dock at Bornholm, where some 700 ships touch annually. Many Russian warships have been built in the shipyards near the city, the great Crayton works there supplying the Russian fleet with torpedo boats. It has a number of tobacco factories, cotton mills, machine shops, sugar refineries and other industrial plants. The School of Navigation and the School for Deaf-Mutes are notable among its public educational institutions, besides which there are a number of gymnasia, a technical institute, a commercial college and a normal training school. In 1910 the population was 49,691, the people being mixed Finns and Swedes, with the Finns predominating. In 1827 a large portion of the city was destroyed by a conflagration, including the University buildings. Since then the University has been removed to Helsingsfors.

ABOLITIONISTS, the extreme section of the anti-slavery party in the United States, who advocated immediate sweeping away by the national government of Southern slavery, without regard to constitutional guarantees, vested interests, or political facts; this section and its nickname date from about 1835. Gradual abolition had been the desire of many of the best men even of the South; and till after the War of 1812 there was no prejudice against the freest expression of opinion on the subject. But the effects of Whitney's cotton-gin were now beginning to be felt in making the slave system for the time enormously profitable; and the Missouri Compromise, with the insistence of the South thereafter that States should be admitted only in pairs, one slave and one free, showed that the time of apathy had gone by. The new zeal of the South in upholding, increasing and justifying the system was met by a new intensity of the North in opposing it, though for a long time confined to a small band of agitators. In 1833 the National Anti-Slavery Society was formed in Philadelphia; in 1831 William Lloyd Garrison had founded the *Liberator,* a weekly continued till 1866, filled from the first with the fiercest denunciation not only of the system but of all connected with it; and a brilliant band of orators, philanthropists and growing political forces,— Wendell Phillips, Charles Sumner, Gerrit Smith and women like Lucretia Mott,— kept the public mind on the alert and furnished a monotonous moral to the course of political events which the people might not otherwise have drawn so readily. There were grades even among these; and the extremists denied the duty of obeying the United States Constitution, since it contained the clause warranting the Fugitive Slave Law, which was denounced as «a covenant with death and an agreement with hell.» In practice they violated it systematically by assisting in the escape of runaway slaves, through the machinery known as the «Underground Railroad,» concealing them from pursuit and forwarding them from stage to stage till they reached Canada. But in 1840 the abolitionists divided on the question of the formation of a political anti-slavery party, and the two wings remained active on separate lines to the end. It was largely due to the abolitionists that the Civil War, when it came, was regarded by the North chiefly as an anti-slavery conflict, and they looked upon the

Emancipation Proclamation as a vindication of this view. See ANTI-SLAVERY SOCIETY; LIBERTY PARTY; SLAVERY; UNITED STATES — CAUSES OF THE CIVIL WAR.

ABOMEY, ä'bō-mā, French West Africa, city of Dahomey, 70 miles inland, north of the port of Kotonu, with which it was connected by rail in 1905. The town is modern and has a good artesian water supply. Before its occupation November 1892 by the French, Abomey was the capital of the native kingdom of Dahomey, a typical African city surrounded by mud walls and protecting ditches, its royal palaces and market square the scene frequently of barbaric festivals attended by human sacrifices. Pop. 16,000.

ABORIGINAL ART. Strictly speaking, the art of the aborigines, that is, of the original inhabitants of any region; and hence by extension, any primitive or savage art unaffected by the contact of a foreign and superior culture. In this sense the term is used without regard to the question of whether the people practising the art are true aborigines or not. The art of the savage tribes of our own time is included under this designation, and is studied carefully for the light it throws on primitive conditions, industries and conceptions. Yet the art of modern savage tribes must be considered as representing rather an early-arrested development than a truly primitive culture. The oldest known products of human industry are the flint and bone implements and the paintings of the prehistoric cave-dwellers of Western Europe, which in many respects, especially in the fine arts of drawing and painting, far surpass the most advanced works of modern savages. These works date from an antiquity estimated at 25,000 to 30,000 years. While in delineation of animal life they are thus superior to modern savage fine art, they reveal nothing of proficiency in the industrial arts of pottery and weaving or basketry, which are prominent in modern savage art. Indeed, basketry and pottery and the applied arts of carving and stamping constitute the chief artistic activities of modern savages. Of these pottery represents the more advanced development culturally. Primitive metal-working is met with in Africa and in some other regions. The ancient art of Central America, Mexico, Bolivia and Peru is aboriginal only in the sense of belonging to the most ancient inhabitants of whom we have exact knowledge in those countries; it exhibits many evidences of a civilization many stages removed from primitive savagery.

The primitive origins of art have been much discussed by anthropologists and philosophers. The earliest human works known, found in caves in the provinces of Dordogne, France, and Santander, Spain, include artistically-shaped flint tools, carved bone handles, pictures engraved on bone, and paintings of animals on cave walls and roofs. But between this vividly realistic prehistoric art of 30 millenniums ago and modern savage art there is a great gulf, in kind as well as time. Modern savage art is almost wholly decorative, seldom realistic. It is so largely fetishistic that some writers derive the primitive artistic instinct wholly from animism — the ascribing of animate magic powers to inanimate objects, and to representations of them and of animals. (See ANIMISM). Others think it is first awakened by the processes of basketry, weaving, string-lashing, etc., which produce certain regularly recurring motives or patterns. Others again find its root in personal adornment by tattooing, smearing with color, etc. Probably all three origins are in a measure correct. The decorative instinct once awakened develops more and more intricate combinations, and this development continues until arrested by the cultural limitations of the people or region. Besides these forms of decorative plastic art, certain "savage" cultures have developed the art-instinct in other directions, such as primitive forms of poetry and drama, music (songs or chants), and the dance. In all these the idea of rhythmic form predominates over substance or content, and it is rhythmic repetition, with or without alternation, that characterizes also all savage ornament, which is never realistic except, perhaps, in certain Australian rock-pictures and bushmen's drawings. Savage decoration, especially that of New Zealand and some other Polynesian islands, displays a keen sense of decorative values in space-filling, and infinite patience of execution. See ART; DECORATIVE ART.

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ALFRED D. F. HAMLIN,
Professor History of Architecture, Columbia University.

ABORIGINES (Lat. "from the origin"; the Greek name was *autochthonoi*), the earliest inhabitants of a country discoverable by civilized investigation. Their relation to the animal world as a whole comes under the head of ANTHROPOLOGY; to other races, under ETHNOLOGY; their culture and conditions, under ARCHÆOLOGY; of special countries, under their names, or those of particular tribes. Specifically, in Roman writers, a race traditionally said to have been driven by the Sabines from their first homes in the mountains around Reate (Rieti), invaded Latium, subjugated the native Siculi and occupied the land, along with a tribe of Pelasgi, the two thenceforth taking the name of Latini. If true, these Aborigines would be of Oscan stock and form the non-Pelasgian element in the Romans.

ABORTION, the expulsion of a fœtus from the uterus before it is capable of carrying on its own life. A variety of different terms have been applied to indicate variations in the character of this process; thus: accidental, when brought about by purely accidental means; artificial or induced, when caused for medical therapeutic reasons; criminal, when induced for purely selfish reasons; tubal, when rupture of the Fallopion tube occurs, discharging the fœtus into the abdominal cavity, the pregnancy thus being extra-uterine.

The causes for this accident, apart from induced abortion, may be due to paternal, maternal or fœtal defects. The proportion of abortions to full-time pregnancies is about 1 to 7 or 10. Of the paternal causes, alcoholism,

syphilis, old age or physical weakness may be cited. The most frequent causes, however, are of fœtal and maternal causes. Death of the fœtus is the most frequent fœtal cause. The maternal causes may be local or constitutional. Inflammation of the membranes of the uterus, tumors or new growths of the uterus, disease of the ovary, and inflammatory adhesions of the closely associated organs, act as local causes. Alcoholism, starvation, as in times of famine, syphilis, lead poisoning, coal-gas poisoning, acute diseases, as typhoid, pneumonia, and sudden severe shock, are the most common agents acting on the mother that bring about the death of the fœtus and its subsequent expulsion. With certain women abortion, or miscarriage, happens very readily.

The symptoms are hemorrhage, discharge of the amniotic fluid and pain. The treatment is always medical. The dangers are mostly those of hemorrhage and infection.

In law, when abortion is produced with a malicious design, it becomes a misdemeanor, and the party causing it may be indicted and punished. When, in consequence of the means used to produce abortion, the death of the woman ensues the crime is designated as murder. In all cases of abortion the body of the offense must first be proven. The fact of the pregnancy, the use of the instruments and the administering of the drugs must be established beyond a doubt. The evidence of the woman upon whom the abortion was committed is admissible but her dying declarations are not admissible unless homicide is charged. A person who sells a drug or instrument, knowing that it is to be used for the purpose of causing a miscarriage, is guilty of a misdemeanor.

ABORTION IN PLANTS. This term is applied to the arrest of development which occasionally occurs in otherwise normal organs of plants, being sometimes contrasted with degeneracy, where we not only find an arrested development but a perversion of form. Abortion may take the form of an inordinate abbreviation of the stem or flower-stalk as in the cauliflower, of irregular development of any part of the leaf, which is sometimes reduced to a mere midrib, of great reduction in the size of some or all of the petals of a flower, of indehiscence in the anther, of abnormal want of succulence in the fruit, or of many other failures of development. Abortion of the sexual organs and sexual cells is probably one of the most common causes for the sterility of many hybrids. Abortion is sometimes due to defective nutrition, sometimes to the intrinsic defect of the organization of the plant. For further information on this subject consult Masters, M. T., 'Vegetable Teratology' (London 1869), and Ward, H. N., 'Disease in Plants' (London 1901).

ABOU BEN ADHEM AND THE ANGEL, ä'boo bĕn ăd'hĕm, title of a poem of which Leigh Hunt was the author. The following line in it is frequently quoted:

"Write me as one who loves his fellow men."

ABOUKIR or **ABUKIR,** ä'boo-kēr, Egypt, a spacious bay with a small village of the same name, 14 miles northeast by rail of Alexandria. It is noted as the scene of the battle of the Nile, 1–2 Aug. 1798, when Nelson defeated the French fleet; of a battle on its shores 25 July 1799 when Napoleon defeated the Arabs; and of the battle of Alexandria 21 March 1801, when Sir Ralph Abercromby defeated the French.

ABOUT, ä'boo, **Edmond François,** French journalist and novelist: b. Dieuze, 14 Feb. 1828; d. 17 Jan. 1885. In 1851 he was sent to the French school in Athens, Greece, after having completed his studies in Paris. After spending two years in Greece he returned to France. In 1856 he attempted to become an actor, without success. He was especially favored by the court of the Second Empire. After the fall of the Empire he ceased writing fiction and devoted himself to the editorship of *Le XIX Siècle*. In 1884 he was elected to the Academy, but died before his formal admission. It is generally admitted that had he taken his talents more seriously he could have become a really great writer, but he was by nature flighty and somewhat shallow. Among his many works are: 'La Grèce contemporaine' (1854); 'Le roi des montagnes' (1856); 'Les mariages de Paris' (1856); 'Trente et quarante' (1858); 'L'homme à l'oreille cassée' (1861); 'Le nez du notaire' (1861); 'Madelon' (1863); 'L'infâme' (1867); 'Le Roman d'un brave homme' (1880). Consult Wells, 'A Century of French Fiction.'

ABRA, ä'-bra, a province and a river in the north of Luzon, Philippine Islands. The province contains numerous deposits of placer gold, and the river gravel is auriferous. Other minerals, such as coal, copper, lead, iron and sulphur, are believed to exist in paying quantities. For its head-hunting tribes, see IGORROTE; PHILIPPINES.

ABRABANEL. See ABRAVANEL.

AB'RACADAB'RA, a magic word supposed to be derived from Abrascas, used as an incantation against inflammation, fevers, or agues, according to the earliest known authority Serenus Sammonicus, a Gnostic, and physician in the 2d century, to the Emperor Caracalla. In his work "De Medicina Præcepta," which was admired by the Emperors Geta and Alexander Severus, he prescribes that the word be written in the form of an inverted cone, as shown in the diagram herewith, folded in the form of a cross, worn on linen as an amulet for nine days, and then before sunrise thrown backward into a stream, flowing eastward. The formula was supposed to make the spirit of the disease gradually loosen its hold upon the patient.

The letters are usually arranged as follows:

ABRACADABRA
ABRACADABR
ABRACADAB
ABRACADA
ABRACAD
ABRACA
ABRAC
ABRA
ABR
AB
A

King, author of 'Gnostics and their Remains' embodies the idea in the following easily memorized lines:

"Thou shalt on paper write the spell divine,
ABRACADABRA called, in many a line:
Each under each in even order place,
But the last letter in each line efface.
As by degrees the elements grow few
Still take away, but fix the residue,
Till at the last one letter stands alone
And the whole dwindles to a tapering cone.
Tie this about the neck with flaxen string:
Mighty the good 'twill to the patient bring.
Its wondrous potency shall guard his head,
And drive disease and death far from his bed.

ABRAHAM or **ABRAM**, the progenitor of the Hebrews and the Arab Bedouin. After deriving his genealogy through Shem to his father Terah and his brothers Nahor and Haran, the narrative in Gen. xi–xxv proceeds as follows,— each step in the pilgrimage being by express direction of Yahwé, to his purpose of founding the Hebrew nation:—

After Haran's death Terah removes with his family from his native Ur of the Chaldees (? Mugheir in southern Babylonia), north to Haran, where he dies. Abram then (at 75) takes his wife Sarai and his nephew Lot, Haran's son, and makes his way north by way of Damascus (stopping to build altars to Yahwé at Shechem and Bethel) to Canaan, where he receives the promise that he shall become the founder of a great nation, and all the families of the earth shall be blessed in him. Being a pastoral nomad, a drouth in Canaan forces him to seek forage in fertile Egypt; where he passes off Sarai as his sister, in fear that her beauty will lead to his murder to possess her, and she is taken by Pharaoh, who, on discovering the deception, restores her, but orders Abram out of Egypt. Accompanied by Lot, he returns to a former encampment between Bethel and Ai. The clans of the two kinsmen quarrel over the limited pasturage, as usual with nomad tribes, and Abram proposes that each follow his own fortune. Lot, wishing to quit nomad life, chooses the fertile Jordan plain; Abram pitches his tent among the oak groves of Mamre, close to Hebron, and the previous promise of his posthumous glory is repeated and solemnly covenanted. Lot is captured in a raid of the Babylonian king, with his Syrian and other allies, against his revolted vassals of the Dead Sea and Jordan valleys, including the kings of Sodom and Gomorrah, who are overthrown; Abram sallies out to his rescue with a band of tribesmen, beats the confederacy and chases them near to Damascus, and not only recovers his nephew but restores the above kings to their thrones, refusing any reward. The property of the childless Abraham is to descend to his trusted servant Eliezer, and Sarai suggests that he avoid this by having a child from a concubine, a common enough arrangement; accordingly he has Ishmael by Sarai's maid Hagar, at 86. Four years later it is revealed by Yahwé in person to Abraham that he shall have a legitimate son by Sarai, whose name is thenceforth to be Sarah (princess) and his own to be Abraham (father of peoples); the promise is afterward repeated by Yahwé and two angels, who visit Abram's tent in human form, the latter going on to destroy Sodom and Gomorrah for their wickedness, and the former staying behind to inform Abram of it. Abram's plea wins a promise of mercy contingent on 10 righteous men being found there, but they are not forthcoming, and only Lot and his family escape. Abram goes to Gerar (Negeb) in southern Palestine, repeats precisely the same performance with the nonagenarian Sarai as before, and the king Abimelech repeats the part of Pharaoh, with the same apologies and reproaches. Isaac is born, Sarah being 90, and Hagar and her boy Ishmael are driven into the desert by Sarah's jealous fears, where Ishmael becomes ancestor of the Bedouin. Isaac is circumcised at eight days old, as a token of Yahwé's covenant with Abraham. Some time in Isaac's boyhood Abraham is commanded by Yahwé to make a burnt-offering of him, and proceeds to obey, but is spared the sacrifice by Yahwé, who accepts a stray ram instead and blesses him for his faith. Sarah dies in Hebron and is buried in the cave of Machpelah, which Abraham buys of Ephron the Hittite. He later marries Keturah, has six sons by her, dies at 175, and is buried beside Sarah. Isaac has previously married Rebekah, so that the succession is assured.

The Jewish stories of Abraham were by no means confined to this account in our canonical book; they had many others, associating him with Nimrod, etc., which are collected in the Talmud; and the Mohammedans invented or preserved many more. The critical view is that there was a real Abram or Abraham (the traditions existing in both forms), with his home at Hebron, probably a considerable man from the number and persistence of the legends about him; but that this is all we know. The names of his brothers and ancestry are not persons but Arab clans, and their relations and movements represent what was handed down or believed concerning the North-Arab league that grew into the Hebrew nation, or its original elements. The path of the "bne Terah" from the southern Euphrates valley into Palestine and elsewhere is certainly a correct type of the actual course, as revealed to us by archæology, of the Semitic tribes who century after century poured out of the Arabian deserts, into and up through western Mesopotamia, to plunder or share the rich Babylonian civilization and wealth, as the barbarians did that of the Roman empire; according to the resistance they found they stayed in the Moabite district, turned west to overrun the Jordan valley, or moved north into Syria. For the archæological results consult the chapters on early times in various histories of the Hebrews, Kittel's, Stade's, Guthe's, etc.; Sayce's 'Patriarchal Palestine' and 'Early History of the Hebrews,' reverent in tone; Tompkin's 'Studies on the Times of Abraham.' Critical commentaries on Genesis are also serviceable. For the rabbinical legends, the sources — in German — are Beer on the life of Abraham, and Grünbaum on the 'Semitic Sagas,' which gives the Mohammedan legends likewise. Consult Commentaries on Genesis by Driver, Gunkel, Dillman, Delitzsch, Holzinger, Strack. Histories of the Hebrews by Stade, Kittel, Guthe, Piepenbring. Also Dhorme, in *Revue Biblique* (1908); Gunkel, 'Abraham' (*in Die Religion in Geschichte*) *und Genwart* (1908); Proksch, 'Das nordhebräische Sagenbuch' (1906); Tomkins, 'Studies on the Times of Abraham' (London 1878).

ABRAHAM, Ladislas, Polish educator and author: b. Sambor, Galicia, 10 Oct. 1860. He was educated at the universities of Cracow and Berlin; began his career in a solicitor's office in Cracow and in 1886 was appointed lecturer in canon law at the University of Cracow. Two years later he was appointed professor of canon law in the University of Lemberg, becoming dean of the law faculty in 1895 and rector of the university in 1900. He is director of the Polish scientific expedition of the Academy of Cracow at Rome and member of the Cracow Academy of Science and of

other scientific associations in Austria. He was nominated Austrian crown councillor, knight of the Order of the Iron Crown, and commander of the Papal Order of Saint Gregory. He is a contributor to the 'Catholic Encyclopædia' and has written numerous treatises and books on canon law and the eccleciastical history of Poland and Russia, including 'Organization of the Church in Poland up to the Twelfth Century' (Lemberg 1893); 'The Commencement of the Organization of the Roman Church in Russia' (ib. 1904), and 'Forms of Engagement and Marriage in Canon Law.'

ABRAHAM A SANCTA CLARA, ä'brä-hăm ä sänk'tą klä'rą, Austrian prior, author and evangelist: b. Kreenheinstetten, 1644; d. Vienna, 1709. He joined the order of barefoot Augustinians in 1662, when he abandoned his real name of Ulrich Megerle. He became the prior of his province, and in 1669 was appointed court preacher at Vienna. Distinguished by exuberant eloquence, in which loftiness and dignity of thought were mingled with grotesque humor, coarse language, puns, slang, and utter fearlessness in attacking the vices of the courtiers and the follies of all classes of society, he attracted crowded congregations. His self-sacrifice during the plague of 1679 exhibited his qualities as a faithful and devoted priest. He was a prolific author, his didactic novel, 'Judas der Erzschelm' (4 vols., Salzburg, 1686–95), being his best known work. His collected writings were published in 21 volumes (1835–54).

ABRAHAM IBN DAUD (DAVID) HALEVI, ibn' dowd ha'lā-vē, Jewish astronomer, historian and philosopher: b. Toledo, Spain, about 1110; d., according to report a martyr, 1180. He was the first to introduce to Judaism that phase of philosophy which is derived from Aristotelian sources, and to his 'Emunah Ramah — Sublime Faith,' Maimonides was largely indebted for many valuable suggestions. His chief historical work is 'Sefer ha-Kababbalah — Book of Tradition,' translated into Latin by Génébrad (1510).

ABRAHAM, Plains of. See PLAINS OF ABRAHAM.

ABRAHAM THE JEW AND THE MERCHANT THEODORE, a tale which was popular in the Middle Ages, in which figure prominently the miracle-working powers of the Saviour in Constantinople. Theodore, the merchant, being sorely pressed by the need of money, accepts two loans from the Jewish money-lender, Abraham, his only security being the oath he takes before the statue. But difficulties continue to beset Theodore for some time, and when finally he is able to repay the loans, he finds himself away in a distant country. Unable to find any means of transmitting the money to Abraham, Theodore casts his money box out into the sea. The currents carry the box to Constantinople where it is recovered by Abraham. When Theodore returns, however, he denies that he has received it. Theodore prays before the statue in whose presence he took the oath, and the result is that Abraham is converted to Christianity.

ABRAHAMITES. (1) A 9th-century sect of Syrian deists, denying the divinity of Christ. (2) In modern use, the Bohemian deists of the later 18th century, who called themselves followers of Huss, but accepted no religious doctrine beyond the unity of God, and nothing of the Bible but the Lord's Prayer. They avowed this creed in 1782 on Joseph II's promise of toleration; but as they would join neither Jewish nor Christian folds, he expelled them from Bohemia the next year and scattered them through Hungary, Transylvania and Slavonia. Many were martyred, others turned Catholic.

ABRAHAMS, Israel, English-Jewish author: b. London, 26 Nov. 1858. His early education was in Jews' College, London, after which he studied in the University of London. After serving for a short period as tutor at Jews' College, he was appointed reader in Talmudic and Rabbinic Literature in Cambridge University. In 1905 he became the president of the Jewish Historical Society of England and he was also the first president of the Union of Jewish Literary Societies. In 1907 he was made honorary president of the Theological Society of the University of Glasgow. From 1889 to 1908 he was editor of the *Jewish Quarterly Review.* His published works are: 'Aspects of Judaism' (1895); 'Jewish Life in the Middle Ages' (1896); 'Chapters on Jewish Literature' (1899); 'Maimonides' (1903); 'Festival Studies' (1905); 'A Short History of Jewish Literature' (1906); 'Rabbinic Aids to Exegesis' (1910); 'The Book of Delight and Other Papers' (1913); 'Annotated Hebrew Prayer Book' (1914); 'Jews' (in Hutchinson's 'History of the Nations,' 1915).

ABRAHAM'S BOSOM, an old Hebrew term, later adopted by the Christians as well, signifying the home of the blessed, symbolized in the art of Byzantium, in which the blessed are pictured as little children being taken into the bosom of Abraham.

ABRAM. See ABRAHAM.

ABRAMS, Albert, American physician: b. San Francisco, Cal., 8 Dec. 1863. After taking his degree of M.D. at Heidelberg University, in 1882, he continued his post-graduate studies in Vienna, Berlin, London and Paris. In 1893 he was appointed professor of pathology in the Cooper Medical College, in which position he continued for five years. In 1904 he became president of the Emmanuel Polyclinic in San Francisco. He is now president of the American Society for Psycho-Physical Research. Among his important works are: 'Synopsis of Morbid Renal Secretions' (1892); 'Manual of Clinical Diagnosis' (1894); 'Consumption — Its Causes and Prevention' (1895); 'Scattered Leaves from a Physician's Diary' (1900); 'Diseases of the Heart' (1901); 'Nervous Breakdown' (1901); 'Hygiene, in a System of Physiologic Therapeutics' (1901); 'The Blues' (1904); 'Diseases of the Lungs' (1905); 'Self-Poisoning; Diagnostic Therapeutics' (1909); 'Spinal Therapeutics' (1909); 'Spondylotherapy' (1910).

ABRANTES, ä-brän'tĕsh, Portugal, a town of Santarem district, Estremadura; on the Tagus, and a junction on the Madrid-Lisbon Railway with the Guarda-Abrantes line, 70 miles northeast of Lisbon. It is a strategic fortified position, founded about 300 B.C., and named by the Romans, Aurantes. An active

river trade is carried on in olive oil, wine, grain and fruit. Abrantes was occupied by the French, 24 Nov. 1807, Marshal Junot the victor later receiving the title of Duke of Abrantes. Pop. 7,000.

ABRASIVES, or those substances used in grinding or polishing, include (1) mineral substances, such as grindstones, millstones and whetstones, which are used by simply shaping up the material found in nature; (2) mineral substances which occur disseminated in the rocks or which must first be freed from impurities and are prepared for use by an initial granulation; (3) artificial abradants. The history of abrasives shows that in ancient times the first class was used, the artificial abrasives now so extensively employed being unknown until quite recently.

Grindstones are manufactured from a tough, gritty sandstone, found chiefly in Ohio, though Michigan, Colorado and West Virginia add to the output, and England, Scotland and Bavaria are also producers. The Ohio and Michigan stones are quarried from the Berea grit (q.v.) of Mississippian age. The production of grindstones in the United States in 1915 amounted to $648,479. *Millstones and Buhrstones* are far less used now than before the introduction of the roller process of making flour, for while the American production in 1880 amounted to $200,000 it fell in 1894 to $13,887. Since 1894 it has steadily increased till in 1912 it was $71,414. The 1915 output was valued at $53,480. This is owing to the increased demand for buhrstones for grinding the coarser cereals, fertilizers, cement rock and various minerals. Millstones are finer grained and more compact than grindstones. They are usually made from sandstone or a quartz conglomerate. The buhrstone (q.v.) from France is the best, but the stones from New York and Virginia meet most of the requirements of the trade. A few are made in Pennsylvania and North Carolina. There are buhrstone deposits in Vermont, Ohio and Alabama which have not been worked of late years; also a newly discovered deposit in California of stone equal to the French. The New York stones come from the Shawangunk grit of Silurian age.

Oilstones, Whetstones and *Scythestones* are to a large extent American products. For nearly a century New Hampshire was the headquarters of the whetstone industry, but Arkansas has held the lead for some years. Whetstone rock is also found in Vermont, Ohio, Kentucky, Pennsylvania and Indiana. The best oilstones from New Hampshire are inferior to those of Garland County, Ark., in which region there are extensive beds of a remarkably compact, white, Paleozoic quartz rock, called Novaculite. Griswold in 1890 announced that this material is a sedimentary deposit of fine-grained quartz and not a chemically precipitated deposit as had been previously supposed. The quarries were largely worked for implements in prehistoric times and since 1840 they have yielded the finest oilstones known. These are sold under the names of "Washita" and "Arkansas" oilstones. The production of oilstones and whetstones in the United States during 1915 amounted to $115,175. The imports, chiefly of razor hones from Belgium and Germany, and of "Turkey" oilstones from Italy and France amounted to $14,247 — about one-third the normal value. Ohio leads in the production of scythestones, New Hampshire, Vermont and Michigan contributing important shares.

Pumice (q.v.), a spongy lava, or a volcanic ash, is used in scouring powders and soaps. It comes chiefly from the Lipari Islands, but is also produced in Utah and Nebraska. The production of the United States in 1915 was valued at $63,185; the imported pumice at $65,691. *Infusorial* or *diatomaceous earth* (Kieselguhr) occurs in beds often miles in extent. It is formed of the siliceous shells of infusoria and diatoms, and is used in scouring soaps and polishing powders. The chief American localities are in Maryland, Virginia, New Hampshire and California. The United States production for 1915 was 4,593 tons, valued at $38,517; but these figures cover not only that used as abrasive, but also a much larger quantity used by sugar refiners and to insulate boilers, etc. *Tripoli* is a similar variety of opal, but formed from a siliceous limestone by the leaching out of the calcium carbonate. Its use as an abrasive is as a polishing powder for metals, etc., but it is also extensively manufactured into filters, for which it is admirably adapted. Extensive deposits are worked at Seneca, Mo., and in Illinois, but the chief supply is imported from Tripoli. The United States production for 1915 was 30,711 tons, valued at $572,504 — four times the output in 1911. The 1915 importation of tripoli was valued at $27,333. *Crystalline quartz,* of which 112,575 tons were mined in Connecticut and Pennsylvania in 1915, is used as a wood finisher, in the manufacture of sandpaper, in the sawing of marble, for cleaning castings, etc. *Garnet* (q.v.) occurs in many of the crystalline rocks, especially in pegmatite and mica schist. Many varieties are recognized by the mineralogist; but the value of garnet as an abrasive, aside from its great hardness, is dependent not on its composition, but on its structure. If this is distinctly lamellar the material will continually present the sharp edges which are so essential to a good abrasive. Garnet which lacks this lamellar structure is of comparatively little efficiency for grinding and smoothing. Garnet is of little value for grinding metals but is of great utility in woodworking. Its low melting point prevents its bonding with refractory materials. Garnet-paper is much superior to sandpaper and is extensively used in woodworking and finishing the soles and heels of shoes. The most important localities are in New York and New Hampshire. The output for 1915 amounted to 4,301 tons, valued at $139,584. *Corundum* (q.v.), being the hardest mineral known, except the diamond, ranks next to it among the natural abrasives. It occurs in enormous quantities in Ontario, which since 1901 has been the leading producer. It was at one time extensively mined in Montana, North Carolina and Georgia which furnished nearly all of the domestic supply, but since 1906 no corundum has been produced in the United States. Small quantities of corundum are produced in India which go chiefly to the English market. The chief deposits of corundum are of magmatic segregation origin, having solidified from a fluid state during the crystallization of very basic igneous rocks. The value

of any sample of corundum depends largely upon its fracture, the crystals which break smooth being of very limited use. *Emery* (q.v.) is a natural mixture of corundum with magnetite or hematite. It has been largely mined at Chester, Mass., and Peekskill, N. Y., but the Massachusetts mines have not been operated of late years. The chief supply, however, comes from the Island of Naxos, Greece, and from Asia Minor. The material is brought to this country as ballast and owing to the low prices at which it is marketed, the sale for the American mineral is much reduced. The United States production for 1915 was 3,063 tons valued at $31,131 — five times the usual output. The Canadian output of corundum in 1915 was $37,798 — about one-sixth the usual production. The importation of emery and corundum was valued at $271,649 — about 55 per cent of the average. *Diamond* (q.v.), owing to its far greater hardness, brings many times the price per carat which any other abrasive brings per pound. The black amorphous "carbonado" found in Brazil is much harder than the crystallized diamond, but it is almost exclusively used for diamond drills, while the dust of the South African "bort" is the material commonly employed as an abrasive in the cutting of diamonds and other precious stones. In 1915 the importation was valued at $75,944. A large division of natural grinding material in the form of quartz pebbles may properly be included under abrasives. Formerly imported altogether, from Denmark, France, Sweden, Labrador and Newfoundland, the war cut off the supply and led to a development of American deposits, chiefly in Nevada, though in many instances hardened steel balls have been found an effective substitute.

Artificial abrasives belong to two principal groups: (1) The aluminous group, comprising alundum and aloxite; and (2) the silicon-carbide group, comprising carborundum and crystolon. Alundum is crystalline aluminum oxide and is the most efficient of all abrasives for steel. The possibility of determining the degree of toughness in the manufacture of this substance leads to a line of special alundum abrasives made purposely for grinding special hardened and toughened steels. Aloxite is of the same general composition as alundum, but with different qualities and adaptations. Its specific use is on malleable iron. Carbide of silicon, called in the United States "carborundum," is the hardest of all abrasives but lacks the toughness of alundum. It is so hard that carborundum wheels have to be trued up with a diamond; no other known substance will cut them. Carborundum is the most effective abrasive for cast iron, chilled iron and brass. Crystolon is a very similar carbide, useful especially on copper, zinc, gold, tin and aluminum. Electrite is a still newer abrasive, with a composition between alundum and carborundum. It is extremely tough, and amorphous in structure, breaking with a sharp fracture, which is durable under heavy work. The production of artificial abrasives in the United States in 1915 amounted to 37,684,000 pounds, valued at $2,248,778. Abrasives are graded by the size of their fragments. After being crushed, the material is sifted through a series of screens, the number of the smallest screen through which the fragments will pass being given them. For mechanical use abrasives are commonly mixed with a bonding material and formed into wheels. These bonds are of four varieties,—vitrified, silicate, elastic and hard rubber. The first is made of fused clays, and can be produced of varying degrees of hardness. This bond does not completely envelop the grains of the abrasive, and thus affords a larger clearance than the other bonds. However, it is entirely without elasticity. The silicate bond is of clay fluxed with sodium silicate at a low temperature. It is affected by dampness and cannot be made into a thin wheel. The elastic bond is made of shellac and other resins. It has a high degree of elasticity and can be formed into very thin wheels. The rubber bond is of vulcanite, also very elastic. By adapting the bond and the abrasive to the work to be done, almost any desired result may be attained. Another thing to be considered is the speed at which the wheel is to be run. With the artificial abrasives a piece of work may be done in a fraction of the time required by the best emery. It is common practice for an alundum wheel to deliver 400,000,000 cutting strokes per minute, and twice that speed is not unusual. On special work the speed is sometimes equal to 2,000,000,000 cuts per minute. Crushed steel is extensively used in sawing, grinding, rubbing and polishing granite, marble and other stone. The finer grades of this abrasive, known as "steel emery" and "steel rouge," are used for working glass. See special articles under the names of the different abrasives for further particulars. Consult Haenig, A., 'Emery and the Emery Industry' (London 1912); *Grits and Grinds* (monthly, Worcester Mass.); United States Geological Survey, 'Mineral Resources of the United States' (chapter "Abrasives" annually); Ries, H., 'Economic Geology' (4th ed., New York 1916).

ABRAVANEL, ä-brä'vä-nĕl, **Isaac ben Jehuda,** Jewish statesman and Bible commentator: b. Lisbon, 1437; d. Venice, 1508. He was the son of the Portuguese treasurer, Dom Judah, and came of an old and distinguished family which traces its origin from King David. He became treasurer to King Alfonso V of Portugal; was banished on the King's death; retrieved his fortunes in Spain where he gained royal favor; was ruined again on the decree of expulsion banishing all Jews in 1492; went to Naples where he again achieved high rank; lost all his possessions when the French took the city in 1495; and finally settled in Venice where he negotiated a commercial treaty between Portugal and the Venetian Republic. His fame rests on his sound scholarship and exegetic writings, illuminated by a clear and keen mind. The chief of these are 'Sources of Salvation' (1496); 'Salvation of His Anointed' (1497); 'Proclaiming Salvation' (1498), which attracted the attention of eminent Christian writers, among them the younger Buxtorf, Buddeus and Carpzov, who condensed and translated them, and introduced them to the world of Christian scholarship.

ABRAX'AS, or **ABRAXAX,** a word used by the Basilidians, a sect of Christians who existed until the 4th century, to designate the many emanations from the Supreme Power. When the word is written in Greek letters, these

letters, computed numerically, have the value of 365, the mystic number so often inscribed on the stones in the Gnostic schools of the Basilidians, indicating the worlds, or spheres, that constituted the Gnostic universe. These stones are cut in various forms and bear a variety of capricious symbols, mostly composed of human limbs, a fowl's head and a snake's body. The word itself the Basilidians did not apply to the highest Deity but to the spirits of the world collectively. Gnostic symbols were afterward adopted by all sects given to magic and alchemy, therefore there is little doubt that most of the abraxas stones in collections were made in the middle ages as talismans. Consult Barzilai's 'Gli Abraxas' (Trieste 1873); King's 'The Gnostics and Their Remains' (London 1887); Kraus' 'Real Encyklopädie der christlichen Altertümer' (Freiburg 1882–86); Dieterich's 'Abraxas Studien' (Leipzig 1891); Schultz's 'Documente der Gnosis' (Jena 1910).

ABRUZZI, Duke of the, Prince Luigi Amadeo Giuseppe Maria Ferdinando Francesco, Italian admiral, mountaineer and Arctic explorer: b. Madrid, 29 Jan. 1873. He is the third son of the late Prince Amadeo, Duke of Aosta, and a first cousin of King Victor Emmanuel III. His two elder brothers, the Duke of Aosta and the Count of Turin, are generals in the Italian army. He was educated at the naval school at Leghorn and rose in the service by his own merits and industry. Being of daring and adventurous disposition, he found an outlet for his energies first, in 1897, by climbing Mount St. Elias, Alaska, the highest peak in the Rockies, 18,000 feet. On 12 June 1899 he sailed from Christiania on the *Stella Polare* in command of a North Pole expedition. He spent one winter in Teplitz Bay, Rudolf Land, but on account of serious damage to his ship he was compelled to return before he could accomplish his aims. He had intended to reach the Pole by a series of sledge expeditions, one of which, commanded by one of his officers, Captain Cagni, started on 11 March 1900 from the base, and on 25 April reached 86° 33′ 49″ N., beating Nansen's previous record. They returned in September. The Duke himself was too severely frostbitten to travel the whole distance, yet the result of his expedition was to establish the outlines of the northern coasts of Franz-Josef Land and the non-existence of Petermann Land. In 1906 he conducted an expedition into Equatorial Africa where he succeeded in climbing the highest peak of Mount Ruwenzori, 16,600 feet high, never before, so far as is known, touched by human foot. Three years later he established another record by climbing Mount Austen, in India, to a height of over 24,000 feet. In the Tripolitaine war the Duke commanded a squadron operating in the Mediterranean and Adriatic. In August 1914 he was appointed commander-in-chief of the Italian navy and when, in May 1915, his country entered the European war, he co-operated with the Allied admirals in maintaining command of the southern waters. See WAR, EUROPEAN.

ABRUZZI E MOLISE, ą-broot'se ā mō'-lē-zā, department in Central Italy, composed of the provinces of Teramo, Chieti, Aquila and Campobasso, comprising an area of 6,380 square miles between the Apennines and the Adriatic Sea. The country is extremely mountainous and includes the higher portions of the Apennines, the elevation in one portion reaching 9,584 feet above sea level. Cattle and swine form an important part of the produce, but in the smaller valleys nestling in among the mountain forests there are many olive orchards, vineyards and grain fields. Here, too, the silk worm is reared and silk is one of the important products. The population is about 1,500,000.

ABSALOM, third son of King David (2 Sam. xiii–xv, xviii; 1 Chron. iii, 2). He revenged his brother Amnon's outrage of his sister Tamar by killing him, and was banished from his father's court for five years. The grudging readmittance probably left him feeling insecure; he cleverly ingratiated himself with the people, and by aid of the shrewd Ahithophel organized a rebellion against his father, which took David unaware and forced him to fly east of the Jordan with a small following, while Absalom gained possession of Jerusalem and the court. With this enormous *de facto* advantage he might easily have maintained his seat; but according to the story, one Hushai, pretending to desert David, ingratiated himself with Absalom, and by cunning and flattery persuaded him to a policy of delay, while Ahithophel urged him to strike quick and hard, the obviously sensible course. David with this breathing-space collected an army; his veteran captain Joab, gray in victories and blood, routed Absalom's forces in "the wood of Ephriam"; and on report that Absalom had been caught by his long hair in the branches he was riding under, and refusal of the messenger to lay hands on the king's son, Joab himself dispatched him with his spear (about 980 B.C.). David could not have suffered the rebel to live; but the statement that he held a grudge against Joab for killing him and ordered public mourning for his son has nothing intrinsically improbable in it. Absalom is represented as a very handsome and charming prince and the chronicler plainly has much sympathy with him.

ABSALON, äb'sä-lŏn, Danish prelate, statesman and military commander: b. 1128; d. 1201; the great historic figure who contributed most to Denmark's rise as an independent nation. He was educated at the University of Paris; became bishop of Proskilde in 1158 and chief counsellor to his boyhood friend, King Valdemar I. In 1168 he rooted out piracy in the Baltic and idolatry in Rügen. In 1184 he destroyed the Pomeranian fleet which had attacked Rügen. He had previously been appointed archbishop of Lund in 1178.

ABSCESS, a local focus of infection by some bacterium which has progressed to the point of formation of pus, which is a collection of broken-down blood cells and of the tissue in which the abscess may occur. As a rule the infecting agent is brought to the tissues by the blood or lymph stream. Abscesses may occur in any tissue or organ of the body. The usual micro-organisms of acute abscesses are various streptococci and staphylococci. Chronic or cold abscesses are chiefly tuberculous in origin. Abscesses are always best

treated surgically. The old-fashioned way of letting an abscess "come to a head" is more dangerous, time-consuming and usually disfiguring. Dispersing an abscess is a delusion.

ABSCHATZ, äp'shats, **Hans Assmann,** FREIHERR VON, poet: b. Würbitz, 4 Feb. 1646; d. Liegnitz, 22 April 1699. A lyric poet of his day, whose poems were in great part called forth by his indignation at the predatory wars of the French. They are simple and without bombast, and show sincere feeling, pure sentiment and a sturdy, patriotic mind entirely free from class prejudices. His 'Poems and Translations' (1704) include a German translation of Guarini's 'Pastor Fido.' Selections from them were edited by W. Müller in 1824.

ABSECON, or **ABSECUM,** a bay and an inlet on the coast of New Jersey, northeast of Atlantic City.

ABSCONDING, the going clandestinely or secretly out of the jurisdiction of the courts, or lying concealed, in order to avoid their process. A person who has been in a State only transiently or has come into it without any intention of settling therein cannot be treated as an absconding debtor (15 Johns. N. Y. 196), nor can one who openly changes his residence (3 Yerg. Tenn. 414). It is not necessary that the debtor should actually leave the State.

ABSENTEEISM, a term applied to the owners of estates in a country who habitually absent themselves from that country and spend the income of their estates in it in another; in current use, referring almost wholly to the Irish nobility whose fixed residence is outside of Ireland. Much of the poverty and many of the disturbances in Ireland have been charged directly to it, and the Irish people have protested against it since 1380. While an Irish Parliament existed, there seemed hope for its gradual dwindling, careers being open for ambitious men in Ireland; but with its abolition the evil is almost incurable. Hungary suffered heavily from the same cause—its aristocracy looking on their native country's language and life as badges of barbarism, priding themselves on being Germans and living in Vienna—till the great national movement set going by Szechenyi and his companions early in the 19th century. Despite the defense of the system by some economists and the good theoretical arguments that may be made for it, in practice its economic, social, personal and political mischiefs are obvious. Not only is the absent landowner and property-owner, collecting his rents by agents, inaccessible to complaints, representations, appeals for help in upbuilding local institutions, etc., and unwilling to acknowledge rackrenting he does not personally see to be such (even a generous and kindly agent dares not be as lenient as he would, in fear of his master); but he should be the leader of his section, the fountain of careers, furnishing it employment, having his own success depend on its prosperity, and the active defender of its interests and rights and susceptibilities. The estate of an absentee owner, in fact, is essentially like a colony in the old conception,—a mine to exploit for outsiders who cared nothing for it; but the colonists of a distant province have a collective power much greater than that of the tenants of an absent landlord. Furthermore, it makes social co-operation for general needs almost impossible. The literature on this subject is nearly coincident with that of the Irish question as a whole; and the debates in Hansard's 'Parliamentary Reports' abound in its discussion.

AB'SIMA'RUS, a soldier of fortune who raised, against the Byzantine emperor Leontius, an army which proclaimed him emperor, A.D. 698. He slit Leontius' ears and nose and threw him into a convent. He was taken in 705 by Justinian II, who, after having used him as a footstool at the hippodrome, ordered him to be beheaded.

ABSINTHE, ăb'sĭnth, a drink prepared from alcohol, the active principle of *Artemisia absinthium,* and other aromatics, notably the volatile oil of anise. Its frequent and prolonged use leads to a diseased condition known as absinthism that is a product of chronic alcoholism to which the effects of the volatile oil of *Absinthium* are added. Other volatile oils probably contribute somewhat to the general result. Absinthism, in the main, is characterized by a greater amount of affection of the brain than is simple alcoholism. The action of the volatile oils is to heighten cerebral excitement, and absinthe-mania is a frequent result of this form of intoxication. On 15 Jan. 1915 its sale was forbidden in France during the duration of the Great War. See WORMWOOD.

ABSIT ŌMEN (Lat. may the omen be absent); God forbid!

ABSOLOM AND ACHITOPHEL. Dryden's 'Absolom and Achitophel,' perhaps the greatest verse-satire in English, was the direct outgrowth of political conditions. The Popish Plot of 1678–79, followed by the rebellion of Monmouth, illegitimate son of Charles II, against his father, had disorganized the kingdom; and the Exclusion Bill, which provided that the succession of James, Duke of York, brother to the king, and a Catholic, should be set aside in favor of the King's Protestant successors, was again being fiercely debated in Parliament. The fate of the bill was still in doubt; Monmouth, though outwardly reconciled to the King, might again rebel; Shaftsbury, implacable enemy of James and instigator of Monmouth's rebellion, though being tried for high treason, might yet be acquitted and live to do further mischief. Amid such conditions, in 1681, Dryden, as poet laureate, was called upon to defend the throne. He answered with a satire that for brilliant characterization, cogent political reasoning, and mastery of form, has at least never been surpassed in English. His object was to expose the characters and motives of the King's opponents and to exhibit Monmouth as their dupe; and by so doing to kill the Exclusion Bill and confirm James in his succession to the throne. Taking a part of the story of Absolom's rebellion against his father David (2 Samuel, xv–xviii), he ingeniously adapts it to contemporary characters and conditions. The story of 'Absolom and Achitophel' is slight and unimportant, but for this defect the characterization and political reasoning amply atone. The characters are not merely impersonal types, nor, unlike most of Pope's, are they too sharply

individualized. Furthermore, they seemingly are drawn without personal animus; the satirist has the air of pronouncing judgment like an Olympian. The portraits of Achitophel (Shaftsbury), Zimri (Buckingham), Shemei (Slingsby Bethel), deserve the place that they have for two centuries occupied in the picture gallery of great satire. Scarcely less remarkable is the cogent political philosophy of the poem, which mingles the specious with the profound. In the mouth of Achitophel, whose reasoning he seems to condemn, the poet puts arguments that are now generally accepted as valid by the greater part of mankind. It is hard to tell just what Dryden really believed. The verse shows mastery of that heroic couplet which Dryden perfected and which is, all things considered, the best vehicle that English satire has discovered. Each couplet, its sense condensed to the last degree, is at the same time "a slap in the face and a stride forwards toward the goal." With such qualities, added to its timeliness, 'Absolom and Achitophel' gained immediate and universal popularity and made literature for the first time in England a power in politics. Although the many replies which it evoked are long since forgotten, it remains great literature in spite of the fact that its political issues are dead and that the world in general has come around to Achitophel's point of view. A second part of 'Absolom and Achitophel' was written by Nahum Tate. To this Dryden contributed only 200 lines (310–509) of satire on the poets Shadwell and Settle, which are in his best vein and which form the only readable portion of the poem.

MARION TUCKER,
Professor of English Literature, Polytechnic Institute of Brooklyn.

ABSOLUTE, opposed to relative; means that the thing is considered in itself and without reference to other things.

In Logic.—(1) Absolute or non-connotative, according to Whately, is opposed to attributive or connotative. The former does not take note of an attribute connected with the object, which the latter does. Thus "Rome" and "sky" are absolute terms; but "Rome, the capital of Italy," and "our sky" are attributive or connotative. (Consult Whately 'Logic,' bk. ii, ch. v, §§ 1, 2–5). (2) According to J. S. Mill, it is incorrect to regard non-connotative and absolute as synonymous terms. He considers absolute to mean non-relative and to be opposed to relative. It implies that the object is to be considered as a whole, without reference to anything of which it is a part or to any other object distinguished from it. Thus "man" is an absolute term, but "father" is not, for father implies the existence of sons and is therefore relative. (J. S. Mill's 'Logic,' bk. i, ch. ii).

In Grammar, a case absolute is one consisting essentially of a substantive and a participle, which form a clause not agreeing with or governed by any word in the remainder of the sentence. In Greek the absolute case is the genitive; in Latin the ablative; in English it is considered to be the nominative. In Latin the words *sole stante* in the expression *sole stante terra vertitur* (the earth turns round, the sun standing still — that is, while the sun is standing still) are in the ablative absolute. In English, *thou leading*, in the following familiar quotation —

> "I shall not lag behind, nor err
> The way, thou leading—" (Milton)

is in the nominative absolute. So also is *I rapt* in the line —

> "And, I all rapt in this, 'Come out,' he said."
> — Tennyson's 'Princess,' Prol. 50.

In Law.—(1) Personal rights are divided into absolute and relative — absolute, which pertain to men as individuals; and relative, which are incident to them as members of society, standing in various relations to each other. The three chief rights of an absolute kind are the right of personal security, the right of personal liberty and the right of private property. (Blackstone's 'Commentaries,' bk. i, ch. i). Similarly there are absolute and relative duties. Public sobriety is a relative duty, while sobriety, even when no human eye is looking on, is an absolute duty. (Ibid.). Property in a man's possession is described under two categories, absolute and qualified property. His chairs, tables, spoons, horses, cows, etc., are his absolute property, while the term "qualified property" is applied to the wild animals on his estate. (2) An absolute decision is one which can at once be enforced. It is opposed to a rule *nisi*, which cannot be acted on until cause be shown, unless, indeed, the opposite party fail to appear. (3) Absolute law: The true and proper law of nature. (4) Absolute warrandice (Scotch conveyancing): A warranting or assuring against all mankind.

In Physics, absolute is opposed to relative. As this relativity may be of many kinds, various shades of meaning arise; thus: —

(1) Absolute or real expansion of a liquid, as opposed to its apparent expansion, the expansion which would arise when the liquid is heated if the vessel containing it did not itself expand. (2) Absolute gravity is the gravity of a body viewed apart from all modifying influences, as, for instance, of the atmosphere. To ascertain its amount, therefore, the body must be weighed *in vacuo*. (3) Absolute motion is the change of place on a body produced by the motion so designated, viewed apart from the modifying influence arising from disturbing elements of another kind. (4) Absolute force exercised by a centre of force; strength of a centre. (5) Absolute zero is that temperature at which bodies are absolutely devoid of heat. It is situated at $\frac{1}{n}$273.10 C. Absolute temperature is temperature measured in centigrade units from absolute zero. See THERMODYNAMICS; ZERO.

In Astronomy, the absolute equation is the aggregate of the optic and eccentric equations.

In Algebra, (x), the absolute value of x, is x if x is real and positive, — x if x is real and negative, and $+\sqrt{a^2 + b^2}$ if x is a complex number of the form $a + ib$, where a and b are real.

In Geometry, the absolute is the region of a projective space which becomes the points at infinity when a Euclidean or non-Euclidean space is constructed from the elements of the projective space. In a Euclidean plane, as a locus, the absolute is a line, and as an envelope a pair of points on the line. In a non-Euclidean plane it is a conic.

In Ethics, absolute ethics are those that are based on a fixed standard, independent of time and of society.

In Metaphysics and Theology, the absolute is a being, often identified with God, which is (*a*) unrelated, (*b*) immediately presented to our consciousness and (*c*) all-inclusive. An unrelated being cannot of course be the subject of the cognitive relation, so that if known it must be known in a manner involving no relatedness. This is why the absolute is supposed to be known immediately. This conception of knowledge without relation is one which it is very difficult to maintain consistently, and almost inevitably leads the absolutist (as the adherent of the doctrine of the absolute is known), to one or the other of the many forms of mysticism. It must be supposed that the mind in some way *becomes* the absolute by virtue of its act of knowledge. Furthermore, the third property of the absolute, that of being all-inclusive, follows directly from its unrelatedness. However, the desire for a finished philosophical system which contains an all-inclusive whole is probably one of the chief motives leading to the selection of an absolutistic standpoint. Consult Spinoza's 'Ethics,' Bradley's 'Logic,' or Bosanquet's 'Logic' for expressions of the absolutistic standpoint.

Absolute Space and Time are space and time viewed apart from their contents. Absolute rest is rest which possesses some intrinsic criterion that differentiates it from motion. The absolute position of a body is its position with reference to a set of axes at absolute rest. Absolute motion and velocity are motion and velocity with reference to a body at absolute rest.

ABSOLUTE, Sir **Anthony,** a character in 'The Rivals,' a comedy by R. B. Sheridan. He is a hot-headed, fiery-tempered, generous old man, always in a towering passion, even while he commends his own mildness of manner. His son, Captain Absolute, is the hero of the play.

ABSOLUTE MONARCHY. See Monarchy.

ABSOLUTE PERMISSIVE BLOCK SYSTEM. See Block Signal System.

ABSOLUTION, in ecclesiastical usage, the freeing from sin or its penalties. In the Catholic Church absolution has two important and distinctive bearings: (1) Absolution from sin; (2) Absolution from censures. The first is defined as the remission of sin, and can only be given by a duly ordained priest in the Sacrament of Penance, which requires, on the part of the penitent, a sincere confession of all his sins, contrition and a firm purpose of amendment. The basis of the doctrine is the authority of the Church and the commission in John xx, 23. In circumstances, where the conditions of the Sacrament of Penance cannot be fulfilled, as in severe illness when the penitent is too weak to speak, or in instant danger of death, conditional absolution may be given on the ground of the moral conviction of the penitent's virtual desire to comply with all the necessary conditions. The Councils of Florence and of Trent defined the form of words to be used: "I absolve thee from thy sins, etc." In the Greek or Eastern Church the deprecatory form is used: "May Christ absolve thee, etc." Absolution from censures merely removes penalties imposed by the Church. It may be given either in the Sacrament of Penance, or in the external form, that is, in the courts of the Church. It is not necessary for the person to be absolved from censures to be present or even living. Absolution for the dead is a short prayer imploring eternal rest and the remission of the temporal penalties of sin over a dead body. In the Protestant Churches in general absolution is simply a declarative power of the minister imploring the divine forgiveness. Consult 'Decrees of Council of Trent'; Denys de St. Marthe, 'Traite de la Confession.'

ABSOLUTISM. A term used in political science to denote that system of government wherein the supreme power is vested in a single authority — individual or collective — unchecked by any constitution or laws. Since absolute power may be exercised under a monarchy, an aristocracy or even a democracy, the term, strictly speaking, does not apply to any particular form of government, though it is usually employed in describing monarchies, as they furnish the most numerous examples of absolutism. United sovereignty is an essential condition of absolutism, since the distribution of the functions of government places that government under restraints. Absolutism characterized all ancient monarchies and has prevailed in all Oriental monarchies, down to Japan of a few years ago. When the barbarians overran western Europe feudalism replaced the absolute monarchy, but the growth of towns and the rise of commercial classes made necessary a strongly centralized government to protect the nation against the feudalistic lords, and the absolute monarch again came into power, uniting in himself the various functions of national life, both political and religious. The Tudors and Stuarts in England, Frederick the Great of Prussia, and Louis XIV of France, with his famous assertion "L'état c'est moi" ("I am the State") are examples of absolute monarchs, though their absolutism was mainly limited to the central government. There are no absolute monarchies in Europe and since 1908, when the government of Turkey was overthrown and a constitution adopted later, the term has not been applicable even to the Ottoman Empire.

The most common method of checking absolutism is to separate the governmental functions. The legislative functions in most states of western Europe and England are exercised by two chambers; in the United States the national and state governments share the powers of sovereignty itself, while in each of these governments the authority is again divided among the legislative, executive and judicial departments. The written constitution or fundamental law made by the people or their representatives is another method of preventing absolutism, since the fundamental purpose of a written constitution is not only to lay down a general plan of government but also to regulate the powers and conduct of those who govern. From the standpoint of the citizen or subject no government, whatever its nature or form, can hold absolute sway in the multitudinous ramifications of human activity, since, being political in character, absolutism is subject to the limitations of human nature and is limited by local government, and, in some countries, by common law;

by international law which restrains sovereign states from acts prejudicial to the interests or injurious to the coexistence of the various states; and by the church, the religious authority of which is usually independent of the state. (See MONARCHY; FEUDAL SYSTEM; DESPOT). Consult Brougham, H. P., 'Political Philosophy' (1842–46); Baldwin, S. E., 'Modern Political Institutions' (1898); Lieber, F., 'Civil Liberty' (3d ed., 1891).

ABSORPTION, in chemistry, absorption is the taking up of a gas by a liquid or by a porous solid; and in natural philosophy it is the taking up of rays of light and heat by certain bodies through which they are passing. Absorption of light is the retention of some rays and the reflection of others when they pass into an imperfectly transparent body. If all were absorbed, the body would be black; if none, it would be white; but when some rays are absorbed, and others reflected, the body is then of one of the bright and lively colors.

In chemistry the coefficient of absorption of a gas is the volume of the gas reduced to 0° Cent. and 760 m.m. pressure, which is absorbed by the unit of volume of any liquid.

Absorption of heat is the retention and consequent disappearance of rays of heat in passing into or through a body colder than themselves.

Absorption of the earth is a term used by Kircher and others for the subsidence of tracts of land produced by earthquakes.

In physiology absorption consists of a series of complicated processes by which the necessary constituents of the body are taken in at certain parts to be distributed to the places of need. The chief substances are water and salts, mainly absorbed in the small intestines; fats, chiefly taken in the cells of the intestinal mucosa after a complicated series of chemical changes; carbohydrates chiefly absorbed at various parts of the intestinal canal after conversion into monosaccharids and proteins which are chiefly taken up by the bloodvessels after passing through the epithelial cells of the intestinal mucosa as peptones, proteoses, or amino-acids. Proteids are not absorbed in the stomach. (See DIGESTION; GASES, GENERAL PROPERTIES OF; LIGHT; OCCLUSION; SPECTROSCOPY). Consult Bayliss, 'Principles of General Physiology'; Starling, 'Human Physiology.'

ABSTRACT OF TITLE, a synopsis, or brief statement, of the evidences of ownership of real estate. An abstract should set forth briefly but clearly every deed, will or other instrument, together with every fact relating in any way to the title, in order to enable the party in interest to form an opinion as to the exact state of the title. The vendor of land, in England, usually furnishes the purchaser with an abstract of title. The vendor is not compelled to furnish an abstract of title in the United States. He usually undertakes to give only a marketable title. Plans and sketches of the premises are generally inserted in abstracts of title.

ABSTRACTION. In logic, the formation of a general concept on the basis of individual entities exemplifying the concept, or of concepts of greater intensity and less extensity. The word is also used to refer to the concept thus formed. For example, when I single out the redness of an apple and recognize it as a separate quality, I am abstracting from the size, taste, smell, etc., of the apple. While the relation of the abstracted concept to the concept from which it is abstracted is altogether a logical one, our tendency to make abstraction is greatly enhanced by our innate psychological tendency to attend to certain striking portions of a sense-datum, while the less impressive aspects of the datum are only vaguely and blurredly noticed. This process of abstraction for the child begins in his noticing differences in familiar objects. Within certain groups some differences are found to be unimportant. These qualities which are found to be of less importance are then abstracted or removed from the complex idea for which the word denoting this group of objects stands. As this process develops it becomes deliberate, and the attention may be directed upon resemblances instead of differences. At this stage the grouping of objects according to likenesses results in classification. Consult any general work on logic or psychology.

ABSYR'TUS. See ARGONAUTS.

ABT, äpt, **Franz,** German song-writer and conductor: b. Wiesbaden, 22 Dec. 1819; d. 31 March 1885. He studied theology at Leipzig, but abandoned it for music at Mendelssohn's instance. In 1841 he became kapellmeister at the court theatre at Bernburg; shortly afterward relinquishing the post for a similar one in Zürich, where he remained till 1852. He was then called to Brunswick as chief conductor of the orchestra in the royal theatre, and made court kapellmeister in 1855. In 1872 he came to the United States at the invitation of a number of choral societies, and was very favorably received; he conducted at the famous Peace Jubilee in Boston in that year. In 1881 he retired to Wiesbaden on a pension. Many of his songs (for example, 'When the Swallows Homeward Fly,' 'Good Night, Thou Child of My Heart,' 'O Ye Tears,' etc.), have endeared themselves to the heart of the people all over the world.

ABU-BEKR, ä'boo-bĕk'r, his original name being, Abd al Kabah ibn Abi Kuhafah al Atik, also Abd Allah, father-in-law of Mohammed, being the father of the Prophet's wife: b. Mecca, 573; d. 23 Aug. 634. On the death of Mohammed, in 632, he was chosen as his successor and the first caliph of Islam. He began waging a successful warfare against his enemies in Arabia, Persia and the Byzantine Emperor Heraclius, but two years later died at the age of 63 and was buried in Medina, near the tomb of Mohammed and Ayesha, the Prophet's wife and his daughter.

ABU-HASSAN, ä'-boo-häs'ăn, surnamed "The Wag," hero of one of the 'Arabian Nights' Tales,' entitled 'The Sleeper Awakened.' Unaware he entertains the caliph and later becomes the monarch's friend and trusted adviser.

ABU KLEA (ABUKLEA WELLS), a place in the eastern Sudan, west of the Nile, on the desert route from Korti to Metammeh, 23 miles north northwest of the latter and about 120 miles from Khartum. Here a battle was fought 17 Jan. 1885 between a British force of 1,500 under Gen. Sir Herbert Stewart and 12,000 Mahdists, of whom 5,000 actually attacked.

Owing to the jamming of a gun, a corner of the British square was broken, the Arabs rushed through, and after a desperate hand-to-hand struggle were driven off. The British lost 18 officers including the giant Col. Fred Burnaby and 150 men. Over 1,200 Arabs were killed.

ABU-SIMBEL, ä'boo-sĭm'bĕl, or **IPSAMBUL,** site of two remarkable Egyptian temples, situated on the left bank of the Nile, in Nubia, south of Assuan, in latitude 22° 22′ N. Both these monuments of ancient Egypt were built by Rameses II, 1388–22 B.C., the smaller one being dedicated to the goddess Hathor while the larger one was dedicated to Ammon of Thebes, Harmachis of Heliopolis and Ptah of Memphis. The façade of the latter measures 119 feet across and stands over 100 feet in height, before which are four sitting colossi, each over 65 feet in height, each representing the Pharaoh. The interior, divided into two large halls and 12 minor chambers and corridors, is fully 180 feet in depth, and the walls are decorated with some of the finest and best preserved examples of ancient Egyptian mural decorative art. The vast outer hall, 54 by 58 feet, is supported by two rows of square pillars, to each of which is attached a statue of the Pharaoh reaching up to the roof. In front of the smaller temple are six statues, each three feet in height, representing Rameses and his consort. Both temples were discovered by Burckhardt in 1817. In 1912 the great colossi of the temple façade were repaired by filling their cracks with cement.

ABU TAMMAM, ä'boo tăm-mäm, Arabian poet: b. near Lake of Galilee, Syria, about 807; d. Mosul 842. It is said that he was born a Christian and that he later became a Mohammedan, but, like most of the Arabian scholars of his time, he was strongly inclined toward scepticism. While still a mere youth he went to Egypt. For the songs he wrote glorifying the campaigns of Al Mutasim against Amorium, in which he accompanied him, he was openly rewarded. He traveled extensively, visiting Armenia and Khorasan. During one of his journeys he was obliged to seek refuge from a snowstorm with Abul Wafa ibn Salama, in Hamadan, whose extensive library was placed at his disposal. It was there that he compiled four collections of Arabic poems, the most famous of which is known as the 'Hamasa.' It is on this anthology that his fame rests most firmly, though he did compose many original poems. The Arabic text of the 'Hamasa' was published (Bonn 1828–47) by G. W. Freytag in two volumes; another edition was published in Bulak (1869) and Calcutta (1856). A German translation, by Friedrich Rückert, has also been published (Stuttgart 1846). Consult Brockelmann, 'Geschicte der arabischen Literatur' (Vol I, 1898).

ABU'L ALA, AL MA'ARRI, ä'bool ä'lä ăl mä-ä'rē, Arab poet and philosopher: b. Ma'arrat al Nu'man, northern Syria, 973; d. 1058. When only four years of age he became totally blind. His early schooling was obtained at Aleppo, Tripoli and Antioch. In 1010 he went to Bagdad, apparently to seek his fortune, but met with little success and finally returned to Ma'arrat, where he remained for the rest of his life. He soon attracted wide attention as a poet and a writer of songs, a collection of them being preserved under the title 'Sikt al Zand.' Later he ventured into philosophical writings, in which he criticized many of the follies of his time and people. In his 'Risalat al Ghufran,' 'Letters of the Forgiven,' he satirized the lives of the forgiven heretics of the past in the other world. He was, in fact, far ahead of his time in his religious ideas, adhering to neither Mohammedan nor Christian creeds, but advocated only the ethical teachings of both religions. Consult Kremer, 'Uber die philosophischen Gedichte des Abu'l Ala al Marri' (1888); Nicholson, 'A Literary History of the Arabs' (1907, p. 313); Margoliouth, 'The Letters of Abu'l Ala' (1906).

ABU'L ABBAS, ä'bool ä-bäs', founder of the Abbasid dynasty of Caliphs. His name was properly Abd Allah, but by the other he was more generally known, to which was added the surname "kunya," "the shedder of blood." His claim to the caliphate was based on the fact that his father, Mohammed ibn Ali, was the grandson of a first cousin of the Prophet, or, the great-grandson of the Prophet's uncle. With this foundation to his pretentions, Abu'l Abbas began his career of conquest in Khorasan in 747, captured Kufa and there, two years later, proclaimed himself caliph. The following year Marwan II was defeated and killed and Abu'l Abbas began a course of systematic massacre of the whole family of the Banu Umyya. He died in 754, being succeeded by his brother Abu Ja 'far al Mansur. Consult Muir, 'The Caliphate' (3d ed., 1899, p. 426); Wellhausen, 'Das arabische Reich' (1902, p. 338).

ABU'L ATAHIYA, ä'bool ä-tä'hĭ-yä, or **ISMAIL IBN AL KASIM,** Arab. poet: b. Anbar, on the Euphrates, 748: d. 825. He lived in Kufa, Hira and Bagdad, leading an ascetic life of extreme simplicity, writing against the religious fanaticism of his time. His poetry reflects his own simplicity in its simple, direct style. A good edition of a collection of his poems was published in Beirut in 1887. Consult Brockelmann, 'Geschicte der arabischen Literatur' (1898, Vol. I, p. 78).

ABU'L FARAJ, ä'bool-fä-räj', or **ALI IBN AL HUSAIN IBN MOHAMMED IBN AHMED AL KURASHI AL ISFAHANI,** Arabic historian: b. Ispahan, Persia, 897; d. 967. He was a descendant of the Umayyads. Early in life he traveled extensively. His chief work is 'Kitab al aghani' ('The Book of Songs'), through which most of the modern knowledge of early Arabic literature is handed down. It includes a large collection of songs, to many of which are appended notes of the writers and anecdotes illustrative of their personalities. The latest edition of the text was published in Cairo (21 vols., 1905).

ABULFAZL, ä'bool-fä'z'l, **MUBARAK I ALLAMI,** historian and vizier to Akbar, the great Emperor of the Mongols: b. 1551; d. 1602. His chief work is a history of Akbar's reign, in two parts. The first, 'Akbar Nāmah,' or 'Book of Akbar,' is an historical narrative, while the second part, 'Ayin-i-Akbar,' or 'Institute of Akbar,' describes the religious and political constitution of the empire. The Persian text of the first part is edited in the 'Bibliotheca Indica' (1867–87), and a transla-

tion by Beveridge may be found in the same collection. A translation of the second part by Blochmann and Jarett may also be found in the same work. Abulfazl initiated that great literary movement through which has been handed down the Persian translations of many Sanskrit, Arabic and Hindu works. He was murdered while on a mission to the Deccan.

ABULFEDA, ä'bool-fĕ-dä', **ISMAIL IBN ALI,** Arabian prince and scholar: b. Damascus, 1273; d. 26 Oct. 1331. In 1310 he became ruler of the principality of Hama, the throne being granted to him by the Sultan for distinguished military services, part of which were against the Crusaders. In 1320 he was granted the dignity of "sultan" with the right to transmit his powers to his heirs. During his entire reign he patronized arts and letters and traveled to Egypt and Arabia. One of his chief works is 'An Abridgement of the History of the Human Race,' beginning with the creation and ending with the year 1329. The text was published in Constantinople in 1870 and several translations have been made. The period covering the Crusades is especially important and has been extensively quoted by Western historians. A part may be found in the first volume of Muratori's 'Scriptores Rerum Italicarum.' The part preceding the Mohammedan era was translated into Latin by Fleischer as 'Abulfedæ Historia ante-Islamitica' (Leipzig 1831). The part dealing with the life of Mohammed has been rendered into English by W. Murray and published in London, and the later parts by Reiske and Adler in 'Annales Moslemici' (5 vols., Copenhagen 1789–94). Abulfeda also contributed richly to modern knowledge of the Moslem world of the time through his geographical writings. A complete edition of this phase of his work was published by Reinaud and de Slane in Paris (1840) and a French translation was published by Reynaud (first part, 1845) and Guyaud (second part, 1883).

ABY'DOS, Greece, town and castle of Asia Minor; on the Hellespont or Straits of Gallipoli, nearly opposite Sestus. It is the point from which Xerxes made his celebrated crossing of the Hellespont on the bridge of boats; and, also, as being the scene of the loves of Hero (q.v.) and Leander (see MUSÆUS). Byron adopts the name in his 'Bride of Abydos' (1813), characterizing it as a clime where "All, save the spirit of man is divine." It is thought originally to have been a Thracian town, which subsequently became a Milesian colony. In 411 B.C. Abydos revolted from Athens and went over to Dercyllidas the Spartan. Subsequently the city was captured by Philip II of Macedonia, but in 196 B.C. it was declared free by the Romans. (2) Another Abydos was situated in Egypt on the upper Nile, and in the Thebaid was second in importance only to Thebes. It has important ruins of the Palace of Memnon and the tomb of Osiris. Here also were found the famous Tablets of Abydos.

ABYSMAL DEPOSITS are accumulations at the bottom of the ocean at great depths known as abysmal depths. They consist chiefly of red and gray clays and oozes or combinations of clays with various shells and animals, such as *Dictonis, Foraminifera* and *Radiolarians.* These deposits constitute the larger part of the deep-sea bottoms. Although there is a vast amount of minute animal life at these abysmal depths this life is confined, so far as definitely known, to a few species. The deposits are made up of the remains of surface and abysmal animals, the latter of which are born, live and die on the bottom of the ocean. Most of the shells of surface animals decompose rapidly at great depths of the ocean, and many of them disintegrate under the pressure of the salt water before they reach the bottom, where they are constantly being added to the deposits. There are various kinds of deposits, classified according to the depths at which they are found and the local influences under which they have been formed; but only a comparatively few of them can be classed as abysmal. One of these abysmal depths exists in the deep bed of the Gulf of Mexico and along nearly the whole course of the Gulf stream. Very little, if any, of the deposits of these great ocean depths is derived from the shores of the bordering continents; for the geological formations going on there seem to be a thing apart from the debris of all except that of the surface animals that pass over them or live above them. As all the abysmal deposits merge into one another geologists have found great difficulty in determining their character in given areas. The 20 or more species of pelagic *Foraminifera* constitute over 90 per cent of the vast quantities of carbonate of lime present in the calcareous oozes of the abysmal depths of the oceans. This animal life, thus wonderfully abundant to-day, is present in a like plentifulness in other geological formations and periods. Living as they do at such a great depth below the surface and being subject to a more or less uniform pressure, the shells of these animals are very much alike in appearance and thickness in all the abysmal deposits and zones. See CONTINENTAL SHELF.

ABYSSINIA (officially Ethiopia), an ancient kingdom of East Africa, now under a monarch who claims the title of empress. Pop. some 8,000,000. Abyssinia may be said to extend between lat. 5° and 15° N., and long. 35° and 43° E. It is bounded on the north by the Italian colony Eritrea, on the west by the Anglo-Egyptian Sudan, on the south by British East Africa and on the southeast and east by British, French and Italian Somaliland and Red Sea colonies. Its frontiers have been frequently changed, but in 1906 England, France and Italy agreed to preserve so far as possible the integrity of Abyssinia as it then existed. The country is divided into nine provinces which comprise the kingdoms of Shoa in the south (including Efat), the strongest and best organized state in Abyssinia,— capital, Addis Abeba, former capital Ankobar with some 2,000 inhabitants, 8,000 feet above sea-level, with a salubrious climate; Amhara in the centre (including Gojam), capital, Gondar, situated on the Gondar plateau, 7,500 feet above the sea; and Tigré in the north, chief places, Antalo, Adua or Adowa and Axum, ancient capital of Ethiopia, the two latter with about 5,000 inhabitants. There are besides territories and dependencies extending to Kaffa and

Harrar in the south and southeast, including large portions of Galla and Somali Lands. Addis Abeba, capital of Shoa, was founded in 1892 by King Menelik as the capital of Abyssinia. It consists of villages and suburbs scattered round the palace over an area of three square miles, and has between 50,000 and 60,000 inhabitants.

Topography.— The more marked physical features of the country may be described generally as consisting of a vast series of tablelands of various and often of great elevations, and of numerous ranges of high and rugged mountains, some of them of very singular forms, dispersed over the surface in apparently the wildest confusion. From these mountains flow inexhaustible supplies of water, which, pouring down by the deep and tremendous ravines that everywhere intersect them, impart an extraordinary fertility to the plains and valleys below.

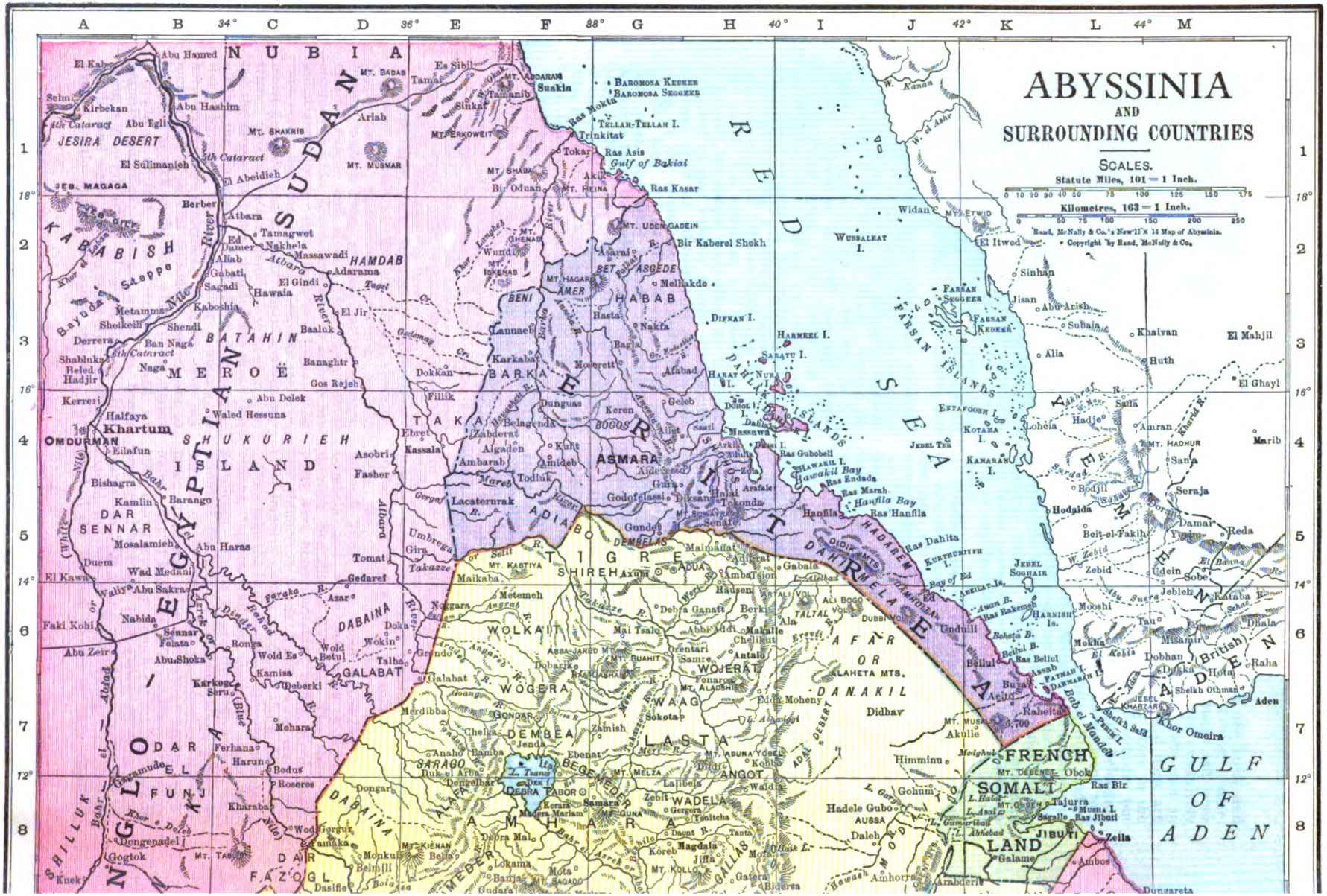
The loftiest and most remarkable mountain summits occur in the Simen range in the centre of the northern part of the kingdom, immediately west of the Tacazzé River. Among the highest of these (so far as known) is Ras Dashan, calculated at 15,160 feet and capped with perpetual snow. Abba Yared and Biuat are slightly lower. Along the eastern side of the country extends a mountain range or escarpment forming a natural rampart, with a mean elevation of 7,000 or 8,000 feet for some 600 miles. No volcanoes are known to exist at present, but almost everywhere are numerous evidences of past volcanic action. Perhaps the principal river of Abyssinia is the Tacazzé, rising in the mountains of Lasta, about lat. 12° N.; long. 39° 20′ E. It runs north and then west, and after leaving the bounds of Abyssinia takes the name of Atbara, and finally joins the Nile. The chief of the other rivers — if not indeed the chief of all — is the Abay or Abai in the centre which, after flowing through Lake Dembea, or Tsana, the largest lake in Abyssinia, runs south and then northwest, and later becomes the Bahr-el-Azrek or Blue Nile, of which it is in fact the upper portion. The Hawash is the principal river flowing east.

Fauna.— The domestic animals consist of horses, cattle, sheep, goats, camels, mules and asses. Mules, camels and asses are the usual beasts of burden, the horses being generally reserved for war and the chase. Vast herds of oxen are met with throughout the country. The wild animals are the lion (rare), elephant, hippopotamus, rhinoceros, crocodile, buffalo, hyena, leopard, boar, antelope, zebra, quagga, giraffe, gazelle and civet. The hippopotamus abounds in Lake Tsana, and great numbers are killed annually for their flesh and hides. The rhinoceros, like the elephant, inhabits the low, moist grounds, and is numerous in certain districts. Crocodiles are found in various rivers, but the largest and most dreaded are those that inhabit the Tacazzé. The buffalo, a comparatively harmless animal in other countries, is here extremely ferocious. Serpents are not numerous but several poisonous species are to be found as well as the boa, which often attains a length of 20 feet. There are many birds of beautiful plumage; bees are numerous, honey being a general article of food; locusts often lay the land waste, and the tsetse fly is destructive to cattle during the rainy season. The flora is very varied and in the low lands and valleys extremely luxuriant. Cotton, sugarcane, date palm, coffee, vine, bananas and other fruits would flourish, but are not extensively cultivated. A wild coffee plant runs riot in southern and western Abyssinia, and there are many valuable timber and rubber trees in the forests. Agriculture is the chief industry but is still in a primitive state, the soil belonging theoretically to the imperial government and the idea of landed property being little understood by the natives. Manufacturing industries are very backward, but cattle, sheep, goats, small hardy horses, donkeys and mules are extensively raised. The chief native products are hides, skins, millet, wheat, barley, tobacco and an excellent Mocha coffee known as Hariri coffee.

Productions.— The chief mineral products of Abyssinia are iron, sulphur, coal and salt, but they are as yet undeveloped. Coal beds extend along the whole of the eastern frontier of Shoa, but as a combustible coal is scarcely known in the country. Salt is obtained in various places, especially from a plain on the southeastern border of Tigré. Gold is obtained from alluvial deposits, but not in great quantity. In some parts of the country iron is abundant and is manufactured into implements. A few hot mineral springs are known and used.

Climate.— The climate of Abyssinia is as various as its surface. In the valleys it is delightful, but on the mountains often cold. The light rains commence in April or May, the heavy rains in June and continue till September (over a considerable portion of the country at least), during which period they are often so violent as to put a stop to agricultural labor.

Commerce.— The foreign trade is chiefly carried on through Jibuti in French Somaliland and other non-Abyssinian ports on the Red Sea and Gulf of Aden and through Gambela and western Abyssinia to the Sudan; but the external traffic has never been of great importance, as the nature of the country is adverse to an extensive trade, and there are relatively few commodities suited for export; moreover, till recently the natives dared not trust their treasures out of their secret hoards, and the royal court was the chief buyer. Menelek's firm administration, however, with its better security for life and property, extended Abyssinian trade considerably, the United States and Great Britain being the chief beneficiaries, France, India, Italy and Germany ranking next. In 1913 the value of exports and imports through Jibuti was about $3,684,240, through Gambela and West Abyssinia $638,235 and through Somaliland $308,500. The chief exports were hides and skins, coffee, wool, ivory and rhinoceros horns, honey, wax, civet; the chief imports, cotton goods, in which American fabrics take the lead, firearms, ammunition, provisions, liquors, railway material, sugar and petroleum. Trade is greatly hampered by the primitive methods of communication, which is carried on by mules and pack-horses; the distance traversed being not above six to eight miles a day at best. In 1902 a railway 187 miles long, constructed by French capital, was opened between Jibuti and Diré Dawa, 25 miles from Harar; in 1909 a new company was formed to extend the line to Addis Abeba. In 1912 it reached the Hawash River, and was expected


ABYSSINIA
AND
SURROUNDING COUNTRIES
SCALES.
Statute Miles, 101 = 1 Inch.
0 10 20 30 40 50 75 100 125 150 175
Kilometres, 163 = 1 Inch.
0 50 75 100 150 200 250
Rand, McNally & Co.'s New 11 X 14 Map of Abyssinia.
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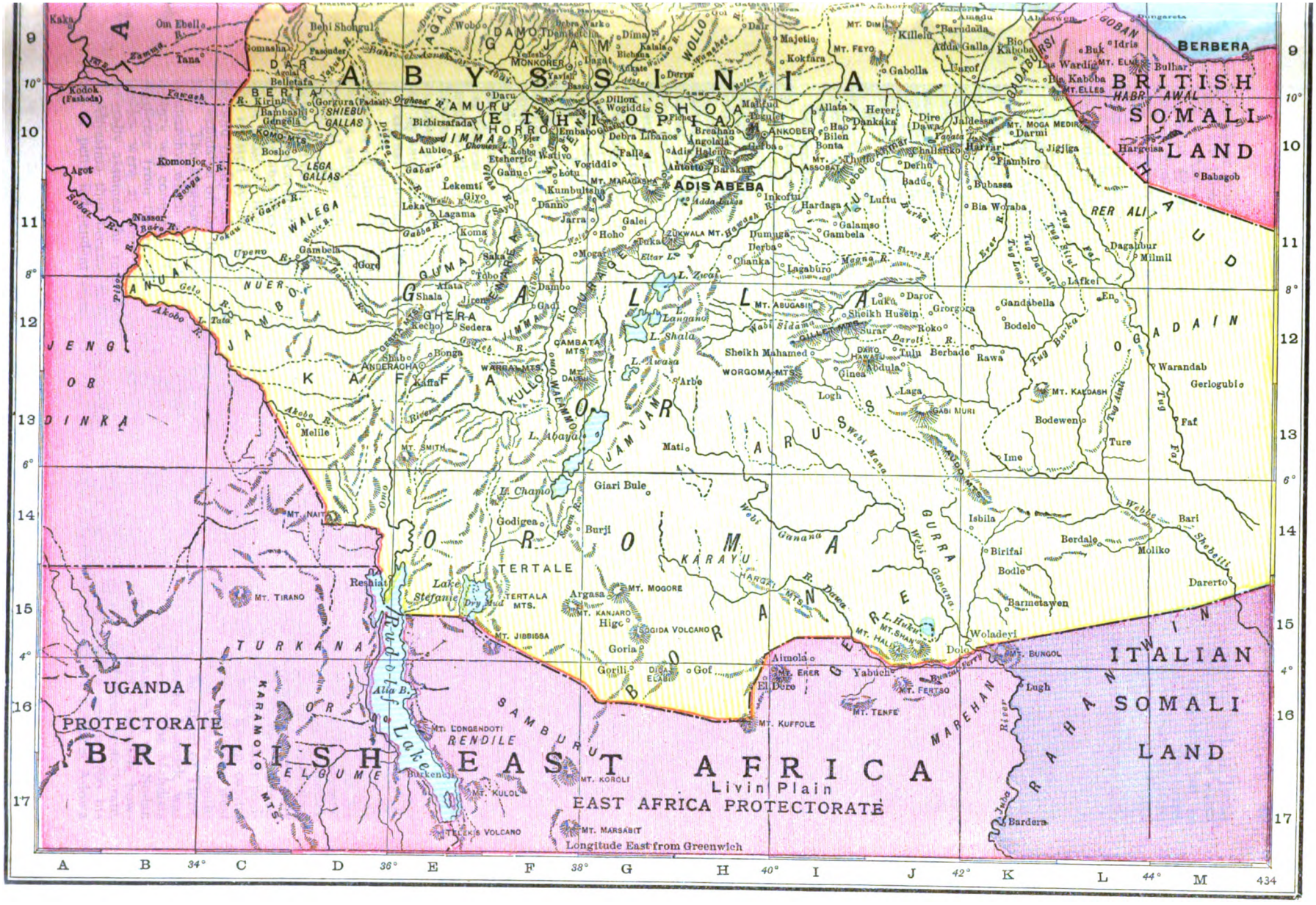
A B C D E F G H I J K L M
34° 36° 38° 40° 42° 44°
1 2 3 4 5 6 7 8
18° 16° 14° 12°
NUBIA
SUDAN
EGYPTIAN
KORDOFAN
KABABISH
HAMDAB
BATAHIN
MEROË
ISLAND
SHUKURIEH
DAR SENNAR
GEZIRA
GLOLO
NUBA
MOUNTAINS
DAR FAZOGL
DAR FUNJ
JESIRA DESERT
JEB. MAGAGA
RED SEA
BARKA
TAKA
ADIABO
TIGRE
SHIREH
ASMARA
DEMBELAS
DAHLAK ISLANDS
FARSAN ISLANDS
DANAKIL
AFAR
OR
DANAKIL
DESERT
WOLKA'IT
WOGERA
GONDAR
DEMBEA
LASTA
WOJERAT
WAAG
WADELA
AMHARA
BEGEMEDER
SARAGO
ANGOT
GALLAS
MEDER
DABAINA
GALABAT
DABAINA
DABAINA
YEMEN
HADRAMAUT
GULF
OF
ADEN
FRENCH
SOMALI
LAND
JIBUTI
AUSSA
Khartum
OMDURMAN
Suakin
Massawa
Asmara
Keren
Adigrat
Adowa
Axum
Makalle
Antalo
Aden
Hodaida
Mocha
Sana
Marib
Zeila
Berbera
Harar
Dire Dawa
Jibuti
Obock
Tajurra
Ras Jibuti
Ras Bir
Ras Asis
Gulf of Bakiai
Ras Kasar
Ras Mokta
Ras Gubobell
Ras Endada
Ras Marah
Ras Hanfila
Ras Dahita
Ras Hanfila
Ras Rakemeh
Ras Beliul
Ras Aeita
Ras Raheita
Ras Dikha
Ras Hotaa
Ras Raha
Ras Aden
Khor Omeira
Bab el Mandeb
Hanfila Bay
Hawakil Bay
Bay of Ed
Gulf of Tadjura
Gulf of Aden
Red Sea
Nile
Blue Nile
White Nile
Atbara River
Setit R.
Mareb
Gash R.
Barka R.
Haseb R.
Anseba R.
Salaam R.
Hawash R.
Awash R.
Auash R.
Gerfad R.
Wadi Sardud
Wadi Kharid
Wadi Hadramaut
Wadi Beihan
Wadi Rahaita
Wadi Mudar
Wadi Kharar
Wadi Sabbat
Wadi Sheikh Said
Wadi Kharbar
Wadi Dah


ABYSSINIA
ETHIOPIA
BRITISH SOMALI LAND
ADIS ABEBA
GOJAM
DAMOT
SHOA
AMURU
HORRO
BERTA
DARASSA
GALLA
LEGA GALLAS
SHIEBU GALLAS
IMMA
WALEGA
GUMA
GHERA
GAMBATA MTS.
ANDERACHA
WARRAI MTS.
KULLO
WORGOMA MTS.
ARUSSI
GALLA
HAUD
RER ALI
OGADAIN
BERBERA
HABR AWAL
GOBAN
DABURSI
KAFFA
JENG
OR
DINKA
ANUAK
NUER
JAMBO
DIMMA
GARAGE
TERTALE
KARAYU
OROMA
BORANE
TURKANA
UGANDA PROTECTORATE
BRITISH EAST AFRICA
EAST AFRICA PROTECTORATE
ITALIAN SOMALI LAND
Livin Plain
Longitude East from Greenwich
L. Stefanie
L. Rudolf
L. Abaya
L. Zwai
L. Langano
L. Shala
L. Awasa
L. Chamo
L. Hukut
Mt. Nairo
Mt. Tirano
Mt. Jibbissa
Mt. Longendoti
Mt. Kulol
Mt. Marsabit
Mt. Kuffole
Mt. Erer
Mt. Fertso
Mt. Tenfe
Mt. Bungol
Mt. Kaldash
Mt. Abugasin
Mt. Smith
Mt. Dalo
Mt. Kanjaro
Mt. Mogore
Mt. Halibo
Mt. Sham
Mt. Koroli
Mt. Dimi
Mt. Feyo
Mt. Elles
Mt. Moga Medir
Mt. Maraqasha
Mt. Zukwala
Mt. Hawadeh
Mt. Assobot
Mt. Thullo
Mt. Kenticha
Mt. Fantalle
Mt. Gedemsa
Mt. Kaputa
Mt. Kenya
Mt. Elgon
Mt. Ruwenzori
Mt. Kilimanjaro
Mt. Meru
Mt. Aberdare
Mt. Logipi
Mt. Loroghi
Mt. Nyiro
Mt. Kulal
Mt. Nyambeni
Mt. Kasigau
Mt. Taita
Mt. Lorian
Mt. Kenia
Mt. Kitui
Mt. Endau
Mt. Mbololo
Mt. Kilulumo
Mt. Kasigao
Mt. Kuranze
Mt. Kuranze
Mt. Kuranze

to be about 30 miles from Addis Abeba in 1915. There are 1,056 miles of telegraph lines. The bank of Abyssinia, chartered in 1905 with a capital of $2,500,000, mainly provided by the National Bank of Egypt, the governor of which is its president, has its headquarters at Addis Abeba. The current coin of Abyssinia is the Maria Theresa dollar, but in recent years an effort had been made to introduce a new currency with the Menelek dollar (worth about 50 cents) as the standard. Saltbars and cartridges are also accepted as currency.

Population.— The native population consists of Semitic Abyssinians, Gallas and Somalis, negroes (in southwest) and Falashas (of Jewish religion). The non-natives are Indians, Arabs, Greeks, Armenians, and a few Europeans. Up to 1907 education was solely in the hands of the clergy. In October of that year compulsory education was decreed for boys over 12, but the edict remained a dead letter. One Abyssinian school with about 100 pupils exists in Addis Abeba. Justice is administered by the provincial governors and petty chiefs with right of appeal to the Emperor. The legal system is supposed to be based on the Justinian Code.

Government.— The government of Abyssinia is feudal in character. Each of the nine provinces has its governor, supposedly under the authority of the Emperor or Negus, and having their retainers, or professional warriors. There is a vague state council composed of the most important *rases,* or chiefs, and a ministerial council constituted by Emperor Menelek in 1908. The regular army numbers about 250,000 men, mostly cavalry, and is supplemented by irregulars and territorial troops in time of war.

History.— Northern Abyssinia corresponds to ancient Ethiopia (see ETHIOPIA), which is still the official name of the country, Abyssinia being a Portuguese form of the Abrabian Habesch, signifying "mixture." Christianity was introduced in the 4th century. In the 6th century the Abyssinians conquered the rich province of Yemen in Arabia and were in constant communication with the outside world for over 50 years. The Mohammedan conquest of Egypt in the 7th century completely isolated them however, and for centuries afterward the kingdom continued in a distracted state, now torn by internal commotions, and now invaded by external enemies (Mohammedans and Gallas). To protect himself from the former the Emperor of Abyssinia, about the end of the 16th century, applied for assistance to the King of Portugal. The solicited aid was sent, and the empire saved. The Jesuit priests, having now ingratiated themselves with the Emperor and his family, endeavored to induce them to renounce the tenets and rites of the Coptic Church and adopt those of Rome. This attempt, however, was resisted by the ecclesiastics and the people, and finally ended, after a long struggle, in the expulsion of the Roman Catholic priests in 1633. The kingdom gradually fell into a state of anarchy, which about the middle of the 18th century was complete. The Negus received no obedience from the provincial governors, who besides were at feud with one another and severally assumed the royal title.

Abyssinia thus became divided into a number of petty independent states and, save for visits from occasional explorers such as James Bruce in 1769, remained shut off from the world until the 19th century. A remarkable, but, as it proved, quite futile attempt to resuscitate the unity and power of the ancient kingdom was begun about the middle of the 19th century by King Theodore, who aimed at the restoration of the ancient kingdom of Ethiopia, with himself for its sovereign. He introduced European artisans, and went to work wisely in many ways, but his cruelty and tyranny counteracted his politic measures. In consequence of a slight, real or fancied, which he had received at the hands of the British government, he threw Consul Cameron and a number of other British subjects into prison in 1864, and refused to give them up. To effect their release an army of about 16,000 men under Sir Robert Napier was dispatched from Bombay in 1867; it landed at Zulla on the Gulf of Aden in January 1868, and after marching 400 miles besieged Magdala, Theodore's capital, which was taken by storm 13 April. Theodore was found among the slain, the general opinion being that he had fallen by his own hand.

After the withdrawal of the English, fighting immediately began among the chiefs of the different provinces, the three most powerful, Kassa of Tigré, Gobasie and Menelek, struggling for the supremacy. This state of matters continued for some time; but at last the country was divided between Kassa, who secured the northern and larger portion and assumed the name of Johannes, and Menelek, who gained possession of Shoa. In 1872 Johannes made himself supreme ruler, with the title of emperor, or king of kings (Negus Negusti). Taking advantage of the troubles in Abyssinia the Egyptians annexed Massowa and adjoining territory on the Red Sea, and hostilities were repeatedly carried on between them and Johannes. In 1885 the Egyptian forces were withdrawn, and Italy, with the consent of Great Britain, declared a protectorate over Massowa and the strip of territory along the coast of the Red Sea. In the following year the Italians pushed inward to Saati, a few miles west of Massowa, an action which led to war with Johannes. An Abyssinian force was sent in 1887 to recover Saati; but though a small Italian force was cut to pieces at Dogali the Italians maintained their position.

On the death of Johannes in 1889, while fighting against the Mahdists, Menelek, who had concluded an alliance with Italy, known as the treaty of Nchali, raised himself to the imperial throne. The result of this was the strengthening of the Italian hold on the country. The Italians regarded their treaty with Menelek as giving them a protectorate over Abyssinia, and by 1892 the whole of Ethiopia was generally recognized as within the Italian sphere. Proceeding to extend and strengthen their position, the Italians in 1889 occupied Keren, capital of the Gogos country, situated 60 miles west of Massowa, and also fortified Asmara, southwest of Massowa. Adowa, the capital of Tigré, and the centre of opposition to Menelek, was occupied in the following year. The Mahdists were also defeated, and Kassala in the Sudan was occupied by the Italians. Menelek, however, later repudiated the Italian protectorate, broke with his former allies, and in 1896 his troops inflicted on them such a defeat at Adowa

as gave a death-blow to their claim of a protectorate over all Abyssinia. The treaty of Addis Abeba concluded in that year between Menelek and the Italians practically abrogated the treaty of seven years before, but left Italy in possession of a strip along the Red Sea coast from the French colony of Obok on the south to Ras Kasar on the north, known officially as Eritrea (Erythræa), the frontiers of which were definitely settled in 1908. A British mission in 1897 was favorably received by the Emperor, a treaty of commerce was concluded and the boundaries between Abyssinia and the British Somali protectorate were arranged. In 1908 a further agreement with Great Britain regulated the boundary between Abyssinia and the Sudan down to 6° N. lat. Abyssinia also has her comprehensive commercial treaties with the United States (1903), Germany and Austria-Hungary (1905), and France (1908). Each of these treaties was to remain in force for a period of 10 years, when it could be terminated at a year's notice. Menelek (b. 1842) died in December 1913 and was succeeded by his grandson Lidj Yasu (b. 1896), who on account of the illness of the Emperor had been virtually ruler, under regents, since 1909.

On 27 Sept. 1916, during the Emperor Lidj Yasu's absence at Harrar, the Metropolitan Abuna Mathaeos released the people and chiefs from their allegiance and deposed the Emperor. In his stead they elected Waizern Zauditu, daughter of the late Emperor Menelek, as Empress of Abyssinia, and designated Degiac Tassari Makonnen as heir to the throne. The deposed monarch, who is a Knight Grand Cross of the Royal Victorian Order (G.C.V.O.), is a son of Menelek's second daughter. The young emperor had received an excellent European education, and at the age of 14 could speak fluently English, French and German. In May 1909, when 13 years old, Lidj Yasu was married to Princess Romani, a granddaughter of the late Emperor John, who had fought against and defeated Menelek (when King of Shoa) in 1877. Sentimentality or favoritism found no part in Menelek's nature; the welfare of his country was his first preoccupation, and it was a well-known fact in Abyssinia that he had carefully studied the nature and character of the youth before he took the step of appointing him as his successor. During the World War, Abyssinian troops were allied with the British in the East African campaign.

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CHARLES LEONARD-STUART,
Staff of the Americana.

ABYSSINIAN CHURCH. The Church founded by Frumentius, the first bishop of Ethiopia, about 330 A.D. About 470 a great company of monks established itself in the country, completely changing the doctrines and affairs of the Church, but was a few years later expelled. From 1528 to 1540, the country was overrun by Mohammedans, followed at the end of the 15th century by the Portuguese Jesuit missions, which remained till 1633, when the Abyssinians resumed allegiance to the Church at Alexandria. The metropolitan (called Abuna) or head of the Church is appointed by the patriarch of Alexandria, and is always a foreigner. The Abyssinians are monophysites, generally agreeing with the Copts in ritual and practice. The fasts are long and rigid; confession and absolution are strictly enforced and the Sabbath and the Levirate law are generally observed. Graven images, purgatory, extreme unction, crucifixes, etc., are prohibited. The priests must marry, but only once. The liturgy is celebrated on the ark in the King's palace at Christmas, Epiphany, Easter and the Feast of the Cross. The Scriptures are read in Geez, the literary language, which is used for all services. Consult Dowling, 'The Abyssinian Church' (London 1909).

ACACIA, ȧ-kā'shȧ, (Gr. *akē,* spine, from their spiny stalks), a genus of plants, family *Mimosaceæ.* They are trees or shrubs with compound pinnate leaves and small leaflets,—in some species wholly or partially undeveloped, when the petiole or leaf-stalk expands into a blade resembling a leaf, hence called phyllodium. Certain species yield gum arabic, gum senegal and other gums; some have astringent barks and pods, used in tanning. Some of the Australian species contain considerable tannin, and hence are exported to a large extent. An Indian species yields an astringent called catechu. Some of the species of tropical America, known as hull-horn Acacias, are interesting because of their large hollow spines which are penetrated and inhabited by ants.

ACACIUS, a-kā'shius, bishop of Cæsarea 340–365 A.D. He founded a curious Christian sect called Acacians, and that may be termed *homoiothelites,* as they held that the Son was like the Father in will, but not of the same or similar substance; thus differing from the Arians. He induced a synod at Constantinople in 359 to accept the doctrine, whereon St. Jerome said that "the world groaned and wondered to find itself Arian." It was finally condemned, however, and he was banished.

ACACIUS, Saint, bishop of Amida in Mesopotamia, early in the 5th century. He sold the church plate to redeem 7,000 starving Persian slaves. Vararanes (Bahram), the king, is said to have been so affected by this noble action that he sought an interview with the bishop, which resulted in a peace between that prince and Theodosius II, A.D. 422, and a hundred years' peace was sworn between Rome and Persia.

ACADEMIC COSTUME. See COSTUME, ACADEMIC.

ACADEMIC DEGREES. Academic degrees, whether earned or honorary, are titles conferred by colleges, universities and professional schools upon persons who, in the opinion of the authorities of these institutions,

have exhibited special proficiency in any branch of knowledge. (See DEGREE). The difference between earned and honorary degrees is that the former are conferred upon students who have completed a certain prescribed course of study and all other requirements of the institution granting such degrees, whereas the latter are conferred upon individuals selected, without examination or other requirement, because they have attained eminence in some line of endeavor.

There is a woful lack of uniformity in the methods used in granting degrees by the educational institutions of the United States. Academic degrees are not and cannot be protected adequately by law. Institutions which claim the right to confer such degrees have increased so rapidly and their standards vary so widely that the value of a degree is greatly lessened. Some small and new institutions and some unauthorized agencies not only bestow the degrees that are properly honorary, for insufficient or no reason, but confer other degrees that should be won only after the completion of a definite course of study. There is a tendency toward uniformity of standards, however, and in 1908 a report was made by a committee of the National Association of State Universities "upon standards for the recognition of American universities and upon standards for the recognition of the A.B. degree and higher degrees." The Carnegie Foundation (q.v.) is also using its influence to standardize degrees by giving the benefits of its pension fund only to those universities and colleges which adopt and enforce certain requirements for admission and study.

In general the lowest degrees, Bachelor of Arts (B.A. or A.B.) and Bachelor of Science (B.S. or S.B.), are given to students who have completed the non-professional four-year college course. There is considerable divergence in the significance of degrees even among the older colleges and universities, since the A.B. no longer indicates, as formerly, that the recipient has completed a definite amount of Greek, Latin and mathematics. The elective system and the tendency to replace the classics by modern languages have obliged the institutions either to change the requirements for the degree or else to substitute a new degree. The second or master's degree — Master of Arts (M.A. or A.M.) and Master of Science (M.S.) — are granted to holders of bachelor's degrees who have completed an additional year of study, although these degrees are often honorary. The degree of Doctor of Philosophy (Ph.D.) is usually bestowed upon those who have completed at least three years of graduate work and have prepared a thesis upon some subject approved by the faculty that will show ability to do original work. This degree is no longer given as an honorary degree by any institution of rank.

Among the more usual degrees, besides those above mentioned, conferred by professional schools are Bachelor of Laws (LL.B.), Doctor of Medicine (M.D.), Bachelor of Divinity (B.D.), Civil Engineer (C.E.), Electrical Engineer (E.E.), Mechanical Engineer (M.E.) and Bachelor of Literature in Journalism (B.Litt.). There are numerous other degrees, honorary and otherwise, such as Doctor of Science (Sc.D.), Doctor of Letters (Litt.D.), Doctor of Laws (LL.D.), Doctor of Divinity (D.D.), Bachelor of Civil Law (B.C.L.), Bachelor of Letters (B.L. or Litt.B.), Bachelor of Philosophy (B.P., B.Ph. or Ph.B.), Doctor of Medical Dentistry (D.M.D.), Doctor of Veterinary Medicine (D.V.M.), Doctor of Law (J.D., *Juris Doctor*), Doctor of Civil and Canon Law (J.U.D., *Juris Utriusque Doctor*), Doctor of Letters or Humanities (L.H.D.), Bachelor of Music (Mus.B.), Master of Laws (L.L.M. or M.L., *Legum Magister*), Master of Civil Engineering (M.C.E.), Master of Mining Engineering (M.M.E.), Doctor of Music (Mus.D.), Graduate in Pharmacy (Ph.G.), Veterinary Surgeon (V.S.), and others which can be found under the title ABBREVIATIONS. The United States Commissioner of Education reports yearly on the degrees granted by institutions, and the catalogues of the institutions will give the conditions attaching to the bestowal of degrees. Consult Paul Monroe (ed.), 'Cyclopedia of Education' (article "Degrees" 1911).

ACADEMIC LEGION, an insurrectionary corps of armed students who made themselves conspicuous at Vienna in 1848.

ACADEMICS, a name given to a series of philosophers who taught in the Athenian Academy, the scene of Plato's discourses. They are commonly divided into three sects: (1) The Old Academy, of which Plato was the immediate founder, was represented successively by Speusippus, Xenocrates and Polemon. (2) To them succeeded Arcesilaus, the founder of the Middle Academy. Under his hands the Platonic method assumed an almost exclusively polemical character. His main object was to refute the Stoics, who maintained a doctrine of perception identical with that promulgated by Dr. Reid in the 18th century. Socrates is said to have professed that all he knew was that he knew nothing. Arcesilaus denied that he knew even this. Wisdom he made to consist in absolute suspension of assent; virtue, in the probable estimate of consequences. He was succeeded by Lacydes, Telecles, Evander and Hegesinus. (3) The New Academy claims Carneades as its founder. His system is a species of mitigated scepticism. He was succeeded by his disciple, Clitomachus. Charmides, the third and last of the new academicians, appears to have been little more than a teacher of rhetoric.

ACADÉMIE DES BEAUX ARTS, ak-ad-ā-mē dā bō zar. See ACADEMY OF FINE ARTS.

ACADEMIES IN AMERICA. In the United States the term academy is not generally applied, as in Europe, to learned societies. The oldest association of the academic type in the United States originated with Benjamin Franklin, who published 'A Proposal for Promoting Useful Knowledge Among the British Plantations in America' in 1743. This resulted in the organization the same year of the "American Philosophical Society Held at Philadelphia for Promoting Useful Knowledge." Franklin was its first secretary, and from 1769 until his death in 1790 its president. Its *Transactions* were first published in 1771, and its *Proceedings* in 1838. It numbers over 500 members and holds an annual general meeting. The American Academy of Arts and

Sciences was founded at Boston in 1780, and dealing largely with the antiquities and natural history of America, has published several volumes of *Transactions* dating from 1785. The Connecticut Academy of Arts and Sciences was founded in 1799. The Academy of Natural Sciences of Philadelphia was founded in 1818 and is a flourishing institution with a fine museum and library. The New York Academy of Science, originally known as the Lyceum of Natural History, was founded in 1818 and received its present title in 1875. The American Association for the Advancement of Science, first organized in 1840 as the American Association of Geologists, now has a membership of over 8,000. The National Academy of Sciences was chartered by Congress in 1863 to investigate and report on scientific questions. Originally limited to 50 members, the number was extended to 150 in 1907. The most important of the national organizations of academic character is the Smithsonian Institution (q.v.) at Washington. The Washington Academy of Sciences, amalgamating several scientific societies of the National capital, was incorporated in 1898. The American Academy of Political and Social Science of Philadelphia, and the Academy of Political Science of New York (Columbia University), are important institutions. Academies of medicine flourish in New York, Philadelphia (established 1799), Cincinnati and Cleveland, an academy of science in St. Louis, and in 1898 the American Academy of Arts and Letters was founded in New York. The Pennsylvania Academy of Fine Arts, famous for its annual exhibitions, was founded in 1807, and the National Academy of Design, in New York, in 1828.

Of scholastic institutions, the earliest was The Academy and College of Philadelphia, founded in 1749 by Benjamin Franklin, chartered in 1753, and in 1779 incorporated as the University of Pennsylvania. Other early schools of this type were the John Phillips academies, established at Andover, Mass., and at Exeter, N. H., and the term is also used in the well-known title of The United States Military Academy at West Point.

The term is also loosely but popularly used to designate places where dancing, riding, fencing, etc., are taught.

In Central and South America among the learned societies of standing are: The Academia Mexicana de ciencas y literatura in Mexico City; the Academia de la historia, at Caracas, Venezuela; the Academia nacional de artes y letras, and the Academia de ciencias, medicas, fisicas y naturales, at Havana, Cuba; the Academia nacional de ciencas, Buenos Aires; the Academia Cearenes, at Ceara, Brazil, and the Academia de Medicine, at Rio Janeiro.

ACADEMY. (1) A school; (2) a society of higher learning. In modern days the word is used to designate British and American schools of higher instruction for youths, ranking with the gymnasia of Germany, and also national military and naval high schools. The name is also applied to various associations of scholars, scientists, literary men, artists, etc., established and organized for the improvement of science, literature or the arts. The origin of the term is traced to the public pleasure ground and gymnasium in the Ceramicus — tile field, a suburb of Athens, said to have belonged in the time of the Trojan war to a local hero, a contemporary of Theseus, named Academus, whence the name. Cimon, the son of Militiades, the proprietor of the land in the 5th century B.C., beautified and planted the grounds with olive and other trees, gave free admission to the public and bequeathed the property to the city at his death. The grounds became a popular resort, where Socrates used to orate, and in its groves Plato taught philosophy. Plato's school became known as the Academie and his followers were called Academists. Subsequently, whenever a Platonist opened a school, he called the institution an academy, and these schools modeled after the original academy, until their abolition by a decree of Justinian, flourished almost continuously for nine centuries. Cicero named his villa near Puteoli "The Academy," and there wrote his 'Academic Questions,' and other philosophic and moral dialogues, based on the conversation and learned discussions of friends whom he entertained as visiting guests. The principal academies of antiquity were the Old, founded by Plato 428–348 B.C., and continued by Speusippus, Xenocrates of Chalcedon, Polemo, Crates and Crantor; the Middle Academy, founded by Arcesilaus 241 B.C., and the New Academy, founded by Carneades 214–129 B.C. Adrian founded an academy at Rome in which all the sciences were taught, but especially jurisprudence. Another academy flourished at Berytus in Phœnicia in which jurists principally were educated. At Alexandria, Ptolemy Soter, one of the generals and successors of Alexander the Great, founded the Musæon, or Museum, the first association of this kind mentioned in history. Devoted to the cultivation of letters and science, he made valuable collections of books and treasures of art, which became the nucleus of the famous great library of Alexandria, and gathered around him scholars of brilliant attainments. In Babylonia, Palestine and Armenia academies were established, and Arabian caliphs, profiting by and improving upon the institutions of their Hebrew and Christian subjects, founded similar establishments for the preservation and increase of learning from Cordoba to Samarkand. At the instigation of David of Alcuin, Charlemagne established an academy in his palace in 782, where men of learning were encouraged to assemble. Cæsar Bardas founded, at Constantinople in the 9th century, a state institution for the promotion of science. Near the end of the 13th and the beginning of the 14th centuries, institutions of this kind, chiefly devoted to the cultivation of poetry, were established at Florence, Palermo and Toulouse, and vied with the universities as seats of learning, culture and intellectual development. Academies of fine arts were established in Florence by Brunetto Latini in 1270, and by Frederick II, at Palermo, in 1300. In 1380 an academy of architecture was established in Milan. One of the most celebrated academies of mediæval times, still surviving after a diversified history, is the Academie des Jeux Floraux (Academy of Floral Games), inaugurated May 1323 by a guild of troubadours; it was permanently endowed in 1500 through the munificence of Clemence Isaure, a wealthy lady of Toulouse; was incorporated by letters patent of Louis XIV in 1694, and reorganized in 1773; the

original name was 'College du gai savoir et de la gaie science' (College of Gay Knowledge and of Gay Science). After the downfall of the Byzantine empire in the 15th century, and the revival of classical culture in Western Europe, academies of a more comprehensive kind were established in Italy. Antonio Beccadella founded, at Palermo, in 1433 the Accademia Pontaniana, so named after Pontaniana, its principal benefactor. Alfonso V founded an academy at Naples in 1440. From 1474 to 1521 the Accademia Platonica, founded by Lorenzo de' Medici, flourished in Florence. Devoted to the study of Plato and Dante, and to the improvement of the Italian language and letters, it numbered Machiavelli, Mirandola and other famous men among its members and became the model for many other similar institutions. Assuming peculiar names, and endowned by wealthy patrons of learning, or by the state, these academies were centres of literary activity for those members of the Italian nobility, debarred for partisan reasons from political life. The Lincei flourished at Rome; the Ardenti at Naples; the Insensati at Parma; the Addormentati at Genoa. The academies of the Vagabonds, the Thunderers, the Smokers, the Dead, the Nocturnals, the Drowsy, the Unstable, the Confused, were to be found in other towns. The Accademia de' Lincei (the lynx-eyed), founded at Rome in 1609 by Prince Federico Cesi, and dissolved at his death in 1632, numbered Galileo among its members. It succeeded the Accademia Secretorum Naturæ, established at Naples in 1560 for the study of physical science, which was soon suppressed by the Church. In 1725 Jakeius published at Leipzig an account of over 600 Italian academies. The most influential and enduring of all was the Accademia della Crusca, i. e., *chaff*, so called in allusion to its principal aim, that of winnowing and purifying the national language. It was founded by the poet Grazzini at Florence in 1582. The dictionary of the Accademia della Crusca, first published in 1612, and subsequently, in augmented form, is considered the standard authority for the Italian language. This academy, incorporated with two older societies, survives as the Royal Florentine Academy. While Italy can thus be regarded as the mother country of modern academies, probably the most celebrated and important of all is the French Academy, founded in 1635 (see INSTITUTE OF FRANCE, THE). An Academia Secretorum Naturæ was founded in Madrid in 1652, and the Spanish Royal Academy in 1714. An academy of Portuguese history was established at Lisbon in 1720 by King John V, and a flourishing academy of science, agriculture, arts, commerce and general economy, by Queen Maria in 1779. In Germany the Royal Academy of Sciences and Belles-lettres was established by the Elector Frederick at Berlin in 1700. In Sweden the Royal Academy of Sciences was founded at Stockholm by six scientists, including Linnæus, in 1739. In Holland the Academia Lugduno-Batava was established at Leyden in 1766. In Belgium the Academie Royale des sciences, des lettres et des beaux-arts was founded at Brussels by Maria Theresa in 1772. In Switzerland an academy of medicine was founded at Geneva in 1715. In Russia The Imperial Academy of Sciences was founded at St. Petersburg in 1725. In England an academy, first suggested as "King James, His Academe, or College of Honor," then as "The British Academy," was finally chartered as the Royal Society (q.v.) in 1662. The term academy in Great Britain is now reserved for institutions devoted to the cultivation of the fine arts and for schools of higher instruction. In Ireland the Royal Irish Academy was founded at Dublin in 1782. See also ACADEMIES IN AMERICA, and for a record of modern academies consult Kukula, R., and Trübner, K., 'Minerva: Jahrbuch der Gelehrten Welt' (Strassburg 1914); Steeves, H. R., 'Learned Societies and English Literary Scholarship in Great Britain and the United States' (New York 1913).

CHARLES LEONARD-STUART,
Staff of the Americana.

ACADEMY, French. See INSTITUTE OF FRANCE.

ACADEMY, The Royal Spanish. See ROYAL SPANISH ACADEMY, THE.

ACADEMY OF ARTS, The Royal. See ROYAL ACADEMY OF ARTS, THE.

ACADEMY OF ARTS AND LETTERS, an American institution founded in 1898 by the American Social Science Association. At its annual meeting that year the Association elected a select group of American authors and artists, who should constitute a National Institute of Arts and Letters. Membership was to be based on distinguished achievement in art, literature or music. At first the body was limited to a membership of 150, then increased to 250. This body then proceeded to organize an Academy of Arts and Letters, the members of which were to be recruited from the general membership of the Institute. The first seven members were elected in 1904: William Dean Howells, Augustus Saint Gaudens, Edmund Clarence Stedman, John La Farge, Samuel Langhorne Clemens (Mark Twain), John Hay and Edward A. MacDowell. These were empowered to elect additional members, each new member being given a vote, until the whole body of 50 had been organized. The living members of the Academy in 1915 were: William Dean Howells, Henry James, Henry Adams, Theodore Roosevelt, John Singer Sargent, Daniel Chester French, John Burroughs, James Ford Rhodes, Horatio William Parker, William Milligan Sloane, Robert Underwood Johnson, George Washington Cable, Andrew Dickson White, Henry Van Dyke, William Crary Brownell, Basil Lanneau Gildersleeve, Woodrow Wilson, Arthur Twining Hadley, Henry Cabot Lodge, Edwin Howland Blashfield, Thomas Hastings, Brander Matthews, Thomas Nelson Page, Elihu Vedder, George Edward Woodberry, Kenyon Cox, George Whitefield Chadwick, Abbott Henderson Thayer, Henry Mills Alden, George deForest Brush, William Rutherford Mead, Bliss Perry, Abbott Lawrence Lowell, Nicholas Murray Butler, Paul Wayland Bartlett, Owen Wister, Herbert Adams, Augustus Thomas, Timothy Cole, Cass Gilbert, William Roscoe Thayer, Robert Grant, Frederick MacMonnies, Julian Alden Weir, William Gillette and Paul Elmer More.

ACADEMY OF DESIGN, National. See NATIONAL ACADEMY OF DESIGN.

ACADEMY OF FINE ARTS, The, a French institution, originally founded in 1648 at Paris under the name of the Academy of Painting and Sculpture. In 1795 it was joined to the Academy of Architecture and has borne its present name since 1819. It publishes memoirs, proceedings and a dictionary of the fine arts. It has 41 members, besides corresponding members, etc.

ACADEMY OF FINE ARTS, Imperial Russian, was first established in a primitive form by the great Emperor Peter I, who, realizing the civilizing power of such institutions, invited to St. Petersburg notable artists in all branches for the purpose of training young Russian aspirants in the arts, or sent abroad those who desired to perfect themselves in painting and sculpture. It was only Empress Catherine II, who, in establishing the Imperial Russian Academy of Science (q.v.), introduced into that institution the teaching of painting and sculpture from other and more progressive countries. While it was unable to produce at once great masters, it certainly succeeded in propagating the history of fine arts and in supplying a few remarkable reproductions from French, Italian, Spanish and German masters, thus acquainting the Russian public with the æsthetic necessities. Empress Elisabeth Petrovna went a step further by separating the School of Fine Arts from the Academy of Science, which act was amplified by Shuvalov, who submitted to the Empress plans for the establishment at the Moscow University of a Faculty of Fine Arts. However, as the court and the Russian aristocracy lived at St. Petersburg, it was definitely decided by the Senate (1757) to establish the Academy of Fine Arts (*Akadyeimiya Hudozhestv*) in that capital, and a sum of 6,000 roubles was appropriated to that effect. Professors of painting and sculpture were mostly French, but it was Russian Shevakinski to whom the chair of architecture was first entrusted and who secured permission from the Empress to move from her palace to the Academy 100 of the finest paintings, which constituted the first picture gallery in that institution. But the small appropriation of 6,000 roubles was soon exceeded and the deficit was repaired by Shuvalov from his private purse. Shuvalov directed the Academy most successfully for six years and, after the death of Empress Elisabeth, he retired and for the following 30 years the Academy was entrusted to the care of Betzki, who secured a constitution and a charter of rights and privileges. Under the direction of Kokorinov the first public exposition of the Academy took place in 1765 to the marvel of the visitors. In 1812 the Academy was placed under the Ministry of Public Education whereby the financial state of the institution was greatly improved. The president of the Academy, A. L. Oleninyi, in order to check the rising criticism of the administration, published a short history of the Academy embracing the period from 1764 to 1829, which showed a crying inadequacy of the administration and caused the Academy to be transferred to the Ministry of the Imperial Court. Under this new protectorate the Academy prospered considerably; the budget was increased, a greater number of students were sent abroad (especially to Rome) and a new constitution was granted (30 Aug. 1859) whereby the program of education was radically changed. The yearly budget was increased to 72,626 roubles and, besides the duty of preparing and training the students of art, the Academy now began to organize, at regular intervals, public expositions, and an art museum was also established. The complete course of study in either of the two divisions of the Academy (painting-sculpture and architecture) lasts five years and the number of students in the last decade varied from 500 to 1,000, of which number about 10 per cent were women.

W. M. PETROVITCH,
Chief of the Slavonic Division, New York Public Library.

ACADEMY OF FRANCE AT ROME, an institution for the advanced study of the fine arts in Rome, Italy; founded by Colbert in 1666, during the reign of Louis XIV. It was at first established in the ruined villa Mancini on the Corso, and in 1803 at the villa Medicis. The young artists, painters, sculptors, architects, engravers and musicians who secure the annual prizes of the Academy of Fine Arts in Paris spend four years there, with an annual pension of 3,500 francs and traveling expenses.

ACADEMY OF INSCRIPTIONS AND BELLES-LETTRES, an institution founded at Paris by Colbert in 1663, under the name of Petite Académie. It was composed originally of four members, chosen by the ministry to belong to the Académie Française. The first members, Chapelain, Charpentier, the Abbé de Bourzers and the Abbé Cassagne, met in a salon of the Louvre or in Colbert's library and devoted themselves to composing the inscriptions for the monuments erected by Louis XIV and the medals struck in his honor; hence their popular name. They undertook a medallic history of the reign of the King. In 1701 the Academy assumed its definitive form; 40 academicians were named. In 1803 the Academy was reconstituted and became the third class of the Institute. Comparative philology, Oriental, Greek and Roman antiquities and epigraphy have received the attention of the Academy, which has published a series of invaluable records and works.

ACADEMY OF MEDICINE, a French institution founded in Paris in 1820 for the purpose of keeping the government informed on all subjects appertaining to the public health. It has sections of medicine, surgery and pharmacy and its publications are highly prized by sanitarians.

ACADEMY OF MORAL AND POLITICAL SCIENCE, founded at Paris in 1795, became the second class of the Institute. It was suppressed by Napoleon in 1803 but was re-established by Louis Philippe in 1832 and forms the fifth class of the Institute. It is composed of 30 members, divided into five sections with five free academicians, five foreign associates and 30 corresponding members.

ACADEMY OF NATURAL SCIENCES OF PHILADELPHIA, an institution founded in 1812. It has one of the best natural-history collections in this country — especially rich in stuffed birds — and a valuable scientific library. It has published 'Journals' since 1817, and 'Proceedings' since 1841.

ACADEMY OF POLITICAL AND SOCIAL SCIENCE, American. See AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE.

ACADEMY OF SCIENCES, an institution founded at Paris in 1666 by Colbert and approved by Louis XIV in 1699. It published about 130 volumes of memoirs from 1666 to 1793, when it was suppressed. It was re-established in 1816. It has now 66 ordinary and 10 honorary members in 11 sections, with two perpetual secretaries, eight foreign associates and 106 corresponding members. Its prizes include an annual sum of 3,000 francs, given alternately for the best essay on a subject in mathematics and physics; the Montyon prizes, six in number and valued at 45,000 francs annually, the Laland prize for astronomy, awarded annually, and several others. The Academy meets annually in December and publishes *Mémoires.*

ACADEMY OF SCIENCE, Imperial Russian. Animated by a desire to develop Russian science to the degree of complete individuality and independence, the great reformer Emperor Peter I united all the most learned men and scientific researchers into one group which he called Akademiya Nauk (i. e., Academy of Sciences), the technical realization of which was entrusted to his imperial physician, Professor Blumentrost. It was in 1724 that Peter the Great definitely approved the plan of Professor Blumentrost whereby the Academy was constituted in three principal parts: mathematics, natural sciences, and history with jurisprudence. Blumentrost was commissioned to invite to St. Petersburg not only Russian scientists but also a great number of foreigners which order he executed with the aid of Professor Wolf who had previously maintained an active correspondence with the Emperor. For the maintenance of the Academy Peter appropriated an annual sum of about 25,000 roubles and also presented that institution with his own library and art gallery. But Peter did not live to see the solemn inauguration of the Academy; that honor fell to the portion of Empress Catharine, which took place on 1 Aug. 1726, notwithstanding the fact that the constitution of the Academy was granted one year previously and the first assembly of the members met in December 1725. The first president of the Academy was Blumentrost. When Peter II came to the throne certain members of the Academy were appointed to direct his education, but when the Emperor went to Moscow together with Blumentrost the directorship of the Academy was entrusted to the librarian, Schuhmacher, who was a selfish and half-learned man with great power and who soon became most unpopular with the members of the Academy. Many of the most learned members resigned their posts, not being able to endure the interference with their scientific research of a director like Schuhmacher. Among the learned members who left St. Petersburg were Professor Eiler and the astronomer de la Cruis, who had spent 22 years in making astronomical researches in Siberia and whom Schuhmacher charged with the theft of Russian state documents; the celebrated author of the history of Siberia, Gerard Friedrick Miller, and others. During the reign of Anna Iohanovna, Schuhmacher's power increased all the more as he enjoyed the protectorate of Blumentrost, after whom the presidency was given over to Keiserling, who tried to curtail Schuhmacher's power, but presided only a year and was succeeded by Korf who was friendly with Schuhmacher. However he improved the finances of the Academy and established in it a department of geography, publishing also in 1739 the first scientific atlas of Russia. In 1740 the presidency was transferred to Brevern who added to the Academy the library and the numismatic collection of Volynski. Finally the academicians lost their patience with Schuhmacher and presented to the Senate a collective complaint against him. As Elisabeth Petrovna was not fond of the Germans and the investigations proved beyond doubt Schuhmacher's misdeeds, he was arrested and the directorship passed over to Nartov, a favorite of Peter I, who immediately discovered some further unwholesome transactions of Schuhmacher that were threatening the Academy with complete financial ruin. He asked and obtained from the Senate a new appropriation to repair the situation. Nevertheless Schuhmacher by some clever, though not honorable, device proved his innocence, the complaint against him was set aside and he reoccupied his old position. When Lomonosov returned from abroad and the presidency passed over to Count K. G. Razumovski, the controversy started afresh and Lomonosov's plan to add a University to the Academy was ignored. In 1745 regulations were adopted in accordance with which there were 10 members to be appointed by the state and as many honorary ones. Soon afterward a fire broke out in the archives of the Academy and Schuhmacher was suspected of being the incendiary. The administrative authority Catharine II granted to the new director of the Academy, Count G. G. Orlov (1766–74), who in turn was succeeded by Domoshnev (1774–82), who in turn was dismissed on account of disorders caused by him. In his stead was appointed Princess E. R. Dashkova (1782–94), a talented writer and follower of Lamonosov. She delivered a number of lectures in the Academy in Russian and translated into the native idiom the principal masterpieces of foreign literature. It was during her administration that the Academy started publishing 'Akedemicheskiya Izvyestiya' (Academic Reports), 'Noviya yezhemyesyachnyia sochineniya' (New monthly compositions), etc. But she was unable to agree with President Nikolay, who was succeeded by Novosiltzev (1803–10). This president issued new regulations increasing the number of the staff to 18 members and 20 assistants and establishing separate sections for history, statistics, political economy and Oriental languages. After Novosiltzev the office of the presidency was held for 37 years by S. S. Uvarov, who further increased the number of members to 21 and reduced that of assistants to 10. He also furthered research work in the fields of ethnography, history and statistics. After the death of Uvarov the presidency was given to Bludov (1847–64) who made many important investigations in the field of Russian philology. He was succeeded by the celebrated explorer, Admiral Lilke. The Academy of Science consists of three parts: (1) physics and mathematics; (2) Russian language;

(3) history, political science and philology. Its annual budget amounts to over 500,000 roubles.

W. M. PETROVITCH,
Chief of the Slavonic Division, New York Public Library.

ACADEMY OF SCIENCES, The National. See NATIONAL ACADEMY OF SCIENCES.

ACADEMY OF SCIENCES, The Royal. See ROYAL ACADEMY OF SCIENCES, THE (Danish).

ACADEMY OF SCIENCES, The Royal. See ROYAL ACADEMY OF SCIENCES, THE (German).

ACADEMY OF SCIENCES, The Royal. See ROYAL ACADEMY OF SCIENCES, THE (Swedish).

ACADIA (Micmac, "plenty"), the original name of Nova Scotia (q.v.).

ACADIA UNIVERSITY, Canada, at Wolfville, Nova Scotia, was founded in 1838 as Acadia College, its act of incorporation conferring the powers of a university, which were confirmed by an Act of 1891, creating a new corporation under the name of the "Governors of Acadia University." They were invested with complete control over Acadia College and also over Horton Academy for boys and the Acadia Seminary for girls. The University grants degrees in theology, and the degrees of bachelor, master and doctor in the several arts, sciences and faculties. The governors are appointed by the Baptist Convention of Nova Scotia, but no religious tests are required of the faculty or students. The institution is coeducational.

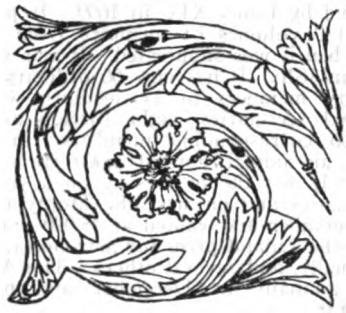
ACADIALITE, a name given to chabazite (q.v.) from Nova Scotia (Acadia). Its color is usually salmon to flesh-red.

ACAJUTLA, äk-a-hoot'la, Salvador, Central America; its second port in importance, exporting coffee and sugar, and the seat of a United States consular agent, 65 miles by rail from San Salvador, the capital.

ACANTHOPTERYGII, a sub-order of teleost fishes, the most comprehensive in the whole class. Its most prominent distinguishing feature is "the presence of non-articulated, more or less pungent, rays in the dorsal and anal fins." It embraces about 75 families of typical bony fishes, including almost all those taken for sport or food from the sea, except of the cod and herring tribes and a few freshwater forms.

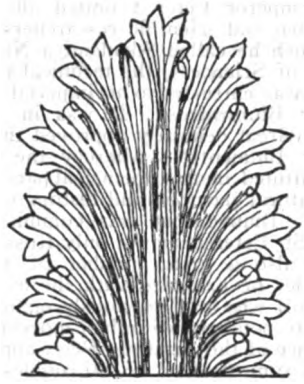
ACANTHUS, the typical genus of the family *Acanthaceæ,* or acanthads, a family of monopetalous exogens, consisting of herbaceous plants or shrubs, found chiefly in the tropics, where they often form a large part of the weedy herbage. *Acanthus* is a native of many parts of southern Europe. The family is represented in America by a few wild-growing species; but they are best known as tender garden plants. The best-known species of the genuine acanthus (or brancursines, as they were formerly called by a euphemism for the still older "bear's-breech"), are *A. mollis* and *A. spinosus.* The former has a stem about two feet high, surrounded in its lower half with large, soft, shining, hairy and deeply indented leaves, and covered from the middle to the top with large white flowers tinged with yellow. See ACANTHUS IN ART.

ACANTHUS IN ART. There are several varieties of the acanthus plant. The two which find expression in art are the *acanthus spinosus*



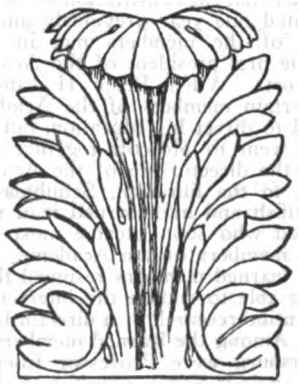
Roman Acanthus Scroll.

and *acanthus mollis,* the former having leaves of sharply pointed indentation, the latter having wider, blunter points. Of all the art motifs



Greek Decorative Acanthus Leaf.

taken from plant life the acanthus has for many centuries been the most prolifically utilized. Its graceful foliation adapts itself, when



Roman Decorative Acanthus Leaf.

slightly conventionalized, to all the decorative arts. In stone (architecture, etc.) it is found in the decorative capital of the columns in the Corinthian Order and in friezes; in metal we find it highly favored by the gold and silver-

smith, the ironworker, the brass trade artisan; in woodwork the acanthus ornamentation is found universally in furniture and mural decorations. The ancient Greeks greatly favored this floral motif and the Romans quickly adopted the device in their art. In the East, also, the use of its decorative value was soon appreciated — in Byzantine it predominates. As in the above plastic arts, so in the graphic, where it is still in very great favor. Most art motifs taken from the flora as well as fauna domain owe some of their appreciation to the fact that they carry with them some reference to symbolism, but the acanthus has no symbolic value whatever.

The actual acanthus leaf is a perpendicular growth, but in the arts it is subjected to curves and convolutions not conforming to nature. The acanthus motif of the Greeks is the *spinosus* variety, while that adopted by the Romans was the *mollis*. Throughout the evolution of the decorative arts the acanthus continues favored by the period styles. We find it taken up, of course, in the Renaissance when it revived the classic forms; the Romanesque utilized it, as did the Gothic. Its delicate scroll decoration appears in the French art of Louis XIV, XV and XVI, though with specialized conventional formations which, to some extent, render these periods separately recognizable.

ACCAD or **AKKAD**, Babylonia, a royal city of Shinar which gave its name to northern Babylonia, as distinguished from Sumer or southern Babylonia. It is the Akkad mentioned in Genesis x, 10, identified with Agade the capital of Sargon and of Naram Sin, still flourishing in the days of Nebuchadnezzar, about 1,100 years B.C. The Kings of Accad were dreaded in Sinai and in Cyprus, 3800 B.C. The exact site of the city is unknown, although it was near Sippara, about 30 miles north of Babylon. It is surmised that it was the oldest quarter of Sippara, on the opposite bank of the Euphrates, identified by British excavations in 1881 with the modern Abu Habba. Consult King, H., 'A History of Sumer and Akkad' (London 1910).

AC'AROID RESIN, or **GUM**, a resin which exudes so abundantly from the grass trees (*Xanthorrhœa*) of Australia as to cover the base of the leaves and the underground portions of the plants, and is also obtained by crushing and sifting or washing, as much as 50 or 60 pounds being obtained from one plant. Two kinds, red and yellow, are generally distinguished, and are used in varnishes as well as for several other purposes.

AC'ARUS, a genus of insects of the tribe *Acaridæ* order, *Arachnida*. They are oviparous, have eight legs, two eyes and two jointed tentacula, and are very prolific. All the species are extremely minute, or even microscopic, as the cheese-mite (*Acarus domesticus*), and many of them parasitic; of the latter, the itch-insect (*Sarcoptes scabici*) is a remarkable example. It is a microscopic animal found under the human skin in the pustules of a well-known cutaneous disease. Many others infect the skin of different animals, such as dogs, hogs and cattle and sometimes in considerable numbers. In some instances they damage cow-hides. (See MITES). *Acarus folliculorum* is a microscopic parasite of the hair follicles of the skin. It is the lowest form of mite, and is known also as *Demodex folliculorum*. See BLACKHEAD.

ACCELERATION, the rate of change of the velocity of a body. If the velocity of the body is constant, its acceleration is said to be zero. If the velocity increases uniformly, so that at the end of every second it is greater than it was at the end of a preceding second by a constant amount, the acceleration is said to be uniform, and the motion is said to be uniformly accelerated. If the velocity is decreasing, the acceleration is said to be negative. A body falling freely under the influence of gravity affords the most familiar example of uniform (or constant) acceleration. When the body falls in air or any other medium, the phenomena are complicated by the resistance of the medium; but when it falls in a vacuum its velocity increases every second by the same constant amount. Thus if the body starts from rest, it will have a velocity of 32.2 feet per second at the end of the first second, 64.4 feet per second at the end of the second second, 96.6 feet per second at the end of the third second and so on. The acceleration produced by gravity is therefore said to be 32.2 feet per second each second; but this varies somewhat with the latitude and the height above the sea. (See FORCE OF GRAVITY). The acceleration experienced under given circumstances is proportional to the force acting upon the body in the direction in which its motion is accelerated. Thus if the foregoing experiment with a falling body were tried upon some other planet, and we found that the velocity of the falling body was increased by 322.0 feet per second every second (instead of 32.2 feet), we should know that the force of gravitation at the surface of that planet is precisely 10 times as great as it is upon the surface of the earth. In physics and theoretical mechanics a force is always measured by the acceleration it produces when exerted upon a unit mass. For a further account of the relation between force, mass and acceleration, also see FORCE.

ACCELEROGRAPHS, devices or attachments for measuring the succession of pressure developed in a given point of a powder chamber by the combustion of a charge of powder either enclosed in a vessel or placed in the bore of a gun and acting on the projectile. The first accelerographs were experimented on in 1873 in Paris, for the study of combustion in a close vessel; afterward, in 1874, on the proving ground of the Nevers foundry for the study of combustion in guns. Since that time various improvements have been successively made in the mode of construction and in the manner of employment. The accelerographs thus modified were employed in numerous experiments, both at the laboratory of the central depot for powder and saltpetre and at the proving ground of the Sevran-Livry powder works with the double advantage of testing both the ingredients and the powder manufactured for the navy. In these trials they proved convenient for handling and also practical, and they furnished some valuable observations on the law of combustion of powder charges, and on that of the development of the pressure resulting therefrom both in close vessels and in guns of various calibres. Also by a slight modification of

the accelerograph, employed for measuring the pressures developed in the firing of guns, this apparatus can be utilized for determining simultaneously the law of the pressure developed in the bore and the law of the recoil of the gun. The accelerographs in question were of the types called slide accelerographs, in which the law of the movement of the piston, subjected to the action of the powder gases, is deducted from the known movement of a style-bearing slide displacing itself in a direction normal to that of the piston. More recently there has been a return to the employment of accelerographs, in which the movement of the piston is deduced from the tracing of the vibrating fork. Finally, from the commencement of the experiments on accelerographs, trial was made conjointly of apparatus called accelerometers, based on the same principle, but which indicated at each experiment only one isolated value of the pressure developed by the powder corresponding to an arbitrary subdivision of the duration of combustion of the charge. These, which require the repetition of identical experiments for determining perfectly the law of the development of the pressures produced by the combustion of a charge of powder placed in certain definite conditions, have been applied to the study of the combustion of powder in a closed vessel, as well as to the study of the pressure developed in the bore of the guns. But they have been more especially employed in this latter case by placing them in front of the initial site of the projectile for measuring the pressure existing against the "sabot" of this latter at the same moment when it attains a definite point of its passage in the bore, because one single experiment with this apparatus suffices to show the value sought. Accelerographs present different arrangements, according as they are intended to be mounted on fixed receptacles for the study of the combustion of powder in a closed vessel, or as it is proposed to mount them on guns; two principal types have been established, the one denominated weight accelerometers and the other spring accelerometers. Fork accelerometers have also been employed for increasing the precision obtained.

The *Slide-accelerograph used for studying the combustion of powder in a closed vessel* is arranged in such a manner as to indicate the law of the movement of a piston, of known section and weight, bedded in a groove cut normally in the sides of the powder chamber and subjected freely, on its base, to the action of the gases produced by the combustion of the charge. The apparatus registers the spaces passed by the piston each instant during the combustion and these passages can be exactly measured by very small and regularly divided intervals of time.

The *Slide-accelerograph, employed for studying the combustion of powder in guns*, has the piston lodged in a steel bushing like those that are designed for the apparatus called crushers employed also for estimating the pressures produced by the combustion of powder. The bushing is screwed into a hole pierced in the sides of the gun normal to the bore, at a point chosen for the purpose, and is terminated on the outside in a threaded head on which is screwed the frame which serves as a guide for the cube designed to receive the table and as a support for the stylus-bearing slide. The only difference in signalling with the powder-mill apparatus is the arrangement placing the additional weight above the piston, when there is room, in order to increase, as occasion requires, the duration of the unobstructed stroke of the piston and to prolong it so as to continue the movement during an interval equal to that of the passage of the projectile in the bore. See BALLISTICS; CHRONOGRAPH.

ACCELEROMETER. An apparatus for measuring the velocity imparted by gunpowder. It shows, by direct registry, the law of the movement in the function of time of a piston subjected to the action of powder-gases. An additional weight placed on this piston in such a manner that it may be thrown vertically without obstacle, when this latter is suddenly stopped, can show, by a single observation, the velocity acquired by the piston up to the end of its stroke. In fact, this weight, thrown freely and preserving the velocity which it had in common with the piston, will be raised to a height, h, given by the relation $v^2 = 2gh$, so that the observation of the height of the vertical stroke h will show the velocity v. If it is admitted that the phenomena of the combustion of the powder are reproduced identically in the like conditions, and if a series of detonations are effected with a constant charge, but varying the stroke each time, it is evident that the observation of the corresponding heights of throw of the additional weight supported by the piston would show the successive velocities acquired by this piston according to the gradually diminishing paths. We could then determine, by this simple process, and without a special chronometric organ, but on condition of repeating the experiments, the law of movement imparted to the piston. See ACCELEROGRAPHS.

ACCENT, the stress or emphasis given by the voice to a certain syllable or syllables of a word, or to certain notes in a bar of music; also, the peculiar intonation of one spoken language when compared with another; further, marks used in printing or writing to show the position of the stress. In a dissyllable there is but one accent, as a-back', but in a polysyllable there may be more than one. One of these, however, is always greater than the rest and is called the primary accent; the others are called secondary.

Two wholly distinct classes of accent are found in Aryan languages, the musical and the expiratory; the former, which is that of some Semitic tongues also, being that of Greek and Sanskrit, the latter that of Latin and Teutonic. Some languages, as French, have no accent, the stress on all syllables being the same, but even here the stopping of the voice gives the final syllable a slight tilt upwards, with the effect of an accent on that syllable. Accent may be free, as in Greek or old Teutonic,— that is, its position in a word may shift in accordance with the nature of the syllables or of the words which follow,— or fixed, as in later Teutonic and English: perhaps the only remnant of the free accent in English is the word "cannot," which, though often spelled as two words, is really a compound word with an accent shifting according to emotion. By a change of stress we often indicate the change of an adjective or a noun

into a verb, as fre'quent (adj.), frequent' (verb); pro'ject (noun), project' (verb).

In compound words the accent is commonly on the first; but when the first element is a prefix, separable or inseparable, it is accented only when the root-word is noun or adjective, the root receiving the accent if it is a verb,— this of course not applying to words borrowed from other languages, for which there is no settled rule, the chance of first usage commonly determining it. The inflections have almost always been left unaccented, and this has aided greatly in the sloughing off of the whole inflectional system in modern languages: even where retained to the eye they are often not pronounced at all, as in French.

There is a certain analogy between accent and emphasis, emphasis doing for whole words or clauses of sentences what accent does for single syllables. One result of this has been to develop duplicate words with different meanings, as *of* and *off*, *to* and *too*, *through* and *thorough* (originally pronounced tho-roo). All modern verse depends on stress-accent (see METRE); while that of classical Greek and Latin, as of some Semitic tongues still, rested on quantity or length of syllables,— a system not easy for those reared on stress to comprehend, much less imitate.

Marks of Accents.— In ancient Greek, accents marked the rise and fall in pitch of the voice, and were three in number, the acute (á), the grave (à) and the circumflex (ã or â). The same marks are now used in French, and the first two in Italian, though they are largely of historical or etymological interest only, and do not always indicate a difference in pronunciation. A mark similar to the acute accent is sometimes used to signify stress in English words, chiefly in poetry; and one like the grave is used to mark as a separate syllable letters otherwise not pronounced so, for example, learnèd, abhorrèd. Marks sometimes called accents are used in mathematics; for example, $a'+b'$ (read *a* prime plus *b* prime). In geometry and trigonometry, a circle at the right of a figure indicates degrees, one mark minutes, two marks seconds of a degree, as 13° 4′ 5″. In mensuration and engineering, the mark denotes feet, inches and lines, as 4′ 6″ 10‴.

In Music.— The greater emphasis or intensity given to certain notes or passages, as distinguished from their length in time and their quality or *timbre*. It is divided into three classes,— grammatical, rhythmical and rhetorical or æsthetic. The grammatical accent is almost always on the first part of a bar; long measures have usually secondary ones, as have polysyllables in words. Rhythmical accent is the more pronounced character given to certain parts of larger compositions,— phrases, themes, motifs,— to mark off entrances, finales or climaxes. Rhetorical accent corresponds strictly to the same emphasis in oratory, in accordance with emotion or a desired effect, and is at the will of the performer.

ACCENTOR ("singer-together"), a literary name for the American water-thrushes (genus *Siurus*) and the European warblers, of which the British hedge-sparrow (incorrectly named) is best known.

ACCEPTANCE, an act by which one agrees to be bound by the terms of a bill of exchange. To render a bill of exchange so valid that, if the drawee fails to liquidate it, the drawer may be charged with costs, the promise of the drawer should be in writing under or upon the back of the bill. An acceptance may be made before the bill is drawn, in which case it must be in writing (15 Johns. N. Y. 6). It may be made after it is drawn and before it becomes due, which is the usual course, or after it becomes due (1 H. Blackst. 313), or even after a previous refusal to accept. The proper form for the acceptance of a bill is to write the word "Accepted" across the bill and sign the acceptor's name, but the drawee's name alone is sufficient or any words of equivalent force to "accepted." Byles on Bills, 147; 21 Pick. (Mass.) 307. See BILL; BANKS AND BANKING — COMMERCIAL PAPER (Article 17).

ACCESS, (1) admission of a husband to intercourse or opportunity of intercourse with his wife. The mere fact that husband and wife live apart creates no presumption of non-access. The issue of the wife, in the absence of direct proof to the contrary, are presumed to be his issue. Except when modified by statute, parents are not permitted to prove non-access in order to show illegitimacy of the wife's issue, either in civil or criminal actions. (2) Admission of an owner of adjoining land to a public road or a public navigable stream. See ACCESS, RIGHT OF. (3) Admission of parents to children having a court as guardian.

ACCESS, Right of. The owner of land adjoining a road or public highway is entitled to access to such highway at any point where it comes up to his land. He may also have an action for the removal, by injunction, of any obstruction to such access, as well as an action for damages. It has been expressly held also that an abutting owner has a property right in the use of the street in front of his land as a means of egress and ingress, and for light and air. (47 N. J. Eq. 421; 106 N. Y. 157). If a man buys a lot of land from which there is no access to a public highway, upon application to the proper authorities he may obtain an order for the construction of a road or highway leading from his land to a public highway. See also RIGHT OF WAY.

ACCESSION is the right to all which a man's own property produces, and the right to that which is united to it by accession either naturally or artificially (2 Kent Comm. 360). If a man builds a house upon his own grounds with the materials of another, or, on the contrary, if a man shall have built a house with his own materials upon the ground of another, in either case the house becomes the property of him to whom the land belongs, for every building is an accession to the ground upon which it stands, and the owner of the land, if liable at all, is only liable to the owner of the materials for the value of them (2 Kent Comm. 362). The same rule holds where vines, trees, fruits and vegetables are planted or sown in the ground of another.

ACCESSORY, in law, one who is not the chief actor in an offense or present at its commission, but still is connected with it in some other way. Accessories may become so before the fact or after the fact. Sir Matthew Hale defines an accessory before the fact as one who, being absent at the time of the crime committed,

does yet procure, counsel or command another to commit a crime. If the procurer be present when the evil deed is being done, he is not an accessory, but a principal. An accessory after the fact is one who, knowing a felony to have been committed, receives, relieves, comforts or assists the felon. In high treason of a pronounced character there are no accessories—all are principals. In petit treason, murder and felonies, there may be accessories; except only in those offenses which, by judgment of law, are sudden and unpremeditated, as manslaughter and the like, which, therefore, cannot have any accessories before the fact. So, too, in petit larceny and in all crimes under the degree of felony, there are no accessories either before or after the fact; but all persons concerned therein, if guilty at all, are principals (Blackst. Comm., bk. iv, ch. iii). Presence and actual participation are necessary to constitute a person an accessory. The mere fact of presence or failure to interfere to prevent the commission of a crime is not, alone, an indictable offense. The person must act in concert with the active party. He must by word or act contribute to the felonious purpose. Presence need not be actual, it may be constructive. A man may commit a crime through the agency of an innocent person, but the agent cannot be convicted. Where an offense is committed within a State by means of an innocent agent, the employer is guilty as a principal, although he did no act in the State where the crime was committed, and at the time of the commission of the offense was in another State. (1 N. Y. 173 (s. c. 45 Am. Dec. 468); 123 Mass. 430).

AC'CHO. See ACRE.

ACCIAIOLI, ätch-yī-ō'lē, **Renatus,** a Florentine who conquered Athens, Corinth and part of Bœotia; lived in the beginning of the 15th century. He bequeathed Athens to the Venetians; Corinth to Theodosius Palæologus, who married his eldest daughter; and Bœotia with Thebes to his natural son Anthony, who also got Athens, but this was retaken in 1455 by Mohammed II.

ACCIDENT, an unforeseen occurrence, particularly if it be of a calamitous character. This is the most common use of the word.

In logic: (*a*) Whatever does not really constitute an essential part of a person or thing; as the clothes one wears, the saddle on a horse, etc. (*b*) The qualities or attributes of a person or thing, as opposed to the substance. Thus bitterness, hardness, etc., are attributes, and not part of the substance in which they inhere. (*c*) That which may be absent from anything, leaving its essence still unimpaired. Thus a rose might be white without its ceasing to be a rose, because color in the flowers of that genus is not essential to their character.

Accidents, in logic, are of two kinds, separable and inseparable. If walking be the accident of a particular man, it is a separable one, for he would not cease to be that man though he stood still; while, on the contrary, if Spaniard is the accident connected with him, it is an inseparable one, since he never can cease to be, ethnologically considered, what he was born (Whately's 'Logic,' bk. ii, ch. v, sec. 4).

In grammar, a property attached to a word which nevertheless does not enter into its essential definition. Each species of word has its accidents: thus those of the noun substantive are gender, declension and number. Comparison in an adjective is also an accident.

In law, an event which under the circumstances is unusual and unexpected by the person to whom it happens. It is the happening of an event without the concurrence of the will of the person by whose agency it was caused, or the happening of an event without any human agency. If a house should be burned in consequence of a fire made for the purpose of cooking, or warming the house, this would be an accident of the first kind. If the house should be set on fire by lightning, this would be an accident of the second kind. (1 Fonblanque, Eq. 374, 375 n.). The best test of liability for the consequence of an accident turns upon the fact whether the person causing the accident was guilty of negligence or not. If he was guilty of negligence he would be liable unless the person injured was guilty of contributory negligence.

In heraldry, an additional note or mark on a coat of armor, which may be omitted or retained without altering its essential character.

ACCIDENT INSURANCE. A policy of accident insurance is a contract providing indemnity for loss of life, limb, sight or time, because of bodily injuries, effected solely and independently of all other causes, through external, violent and accidental means. The full principal sum of the policy is payable in case of death, loss of both hands or both feet, of one hand and one foot, or the sight of both eyes. One-half of the full principal sum is payable in case of the loss of either hand or foot or the sight of one eye. A fixed sum is payable weekly for the term of temporary disability, whether total or partial, not exceeding a certain definite period, varying from six months to two years, and frequently for the life of the insured. The premium, which is generally estimated on the annual basis, is determined by the business, occupation or profession of the applicant, and is proportioned upon the amount of the principal sum and the weekly indemnity named in the policy. Double amounts, both of the principal sum and of the weekly indemnity, are payable in case of injuries received in or on a moving conveyance, provided for the use of passengers, and propelled by steam, electric or cable power; or for injuries received in or while entering or leaving passenger elevators; or in burning buildings, or for injuries caused by falling walls; or from automobile accidents on the highway; or caused by a stroke of lightning; or by the explosion or rupture of a steam boiler; or by a cyclone or tornado.

The policy also provides for hospital treatment; for the payment for medical and surgical fees and for operations; for the payment of optional indemnity, in cases of certain named injuries, in lieu of weekly indemnity; and for annual accumulations of the principal sum and the weekly indemnity until the same amount to 50 per cent in addition to the original sums: also for emergency indemnity to place the insured in care of friends or relatives in case of injury away from home.

Accident insurance was first introduced in this country by James Goodwin Batterson of Hartford, Conn., after his return from a trip

to England in 1859, where he learned of accident insurance, in the form of tickets, insuring the holder for a specified sum, in case of death or injuries resulting from railway accidents. The first American accident insurance company was organized in 1863 at Hartford, and it is said that the first insurance contract made by the company was a verbal agreement between the president of the company and a citizen of Hartford, whereby, in consideration of a premium of two cents, the company agreed to indemnify the insured in the sum of $5,000, in case of accident to the insured while journeying from the post-office to his home in Buckingham street.

Growth.— The growth of the business has been phenomenal since that modest beginning, as the following figures will attest: Premiums received from 1873 to 1892, $42,027,207; losses paid $18,125,771; from 1893 to 1916 premiums received $426,600,679; losses paid $183,804,575.

The above figures cover the operations of the stock insurance companies, of which there were 119 transacting business in 1916 with premiums written in that year of $43,043,546, and losses paid of $19,159,528, including health insurance in the case of some companies that do not report their accident and health premiums and losses separately. There are in addition, however, a large number of mutual accident insurance associations operating in the United States upon the assessment plan and providing to their members accident and sickness insurance at a cost much less than could be obtained from stock companies. This business has increased since 1901 from premiums or assessments received of $1,111,232 and claims paid of $715,429 to premiums or assessments of $6,937,175 and claims paid $4,834,479 in 1916, covering the operations of 56 companies.

The number of certificates in force at the close of 1901 was 146,185, while at the end of 1916 this number had increased to 799,761. The total admitted assets increased during the same period from $930,471 to $4,360,666; total liabilities from $84,630 to $2,065,919, and net surplus from $845,841 to $2,296,747.

In a word, accident insurance has assumed a leading place in insurance underwriting of the United States, and the ever-increasing competition of new companies and the activities of those now in business has resulted in the continued broadening of the policy and the granting of additional benefits. At the present time, the modern, up-to-date policy is practically conditionless and pays indemnity for life, in case of total or partial permanent disability, thereby affording to the unfortunate an annuity that may be his only source of income. Partners in business and officers in corporations take out large policies, payable to the firm or to the corporation, protecting them against loss in case of the removal by death of a valued member of the organization. In many such ways, accident insurance proves to be not only a benefaction, but actually a conserver of credit.

EDWIN W. DELEON,
Member Insurance Society of New York.

ACCIDENTALISM. The theory that events may happen without any cause whatever. If we accept the old view of the causal relation as fundamental and in need of no definition, the meaning of accidentalism is clear enough. If on the other hand, we take the Humain view that cause is mere constant concomitance, and that causal laws merely express one sort of occurrence as a function of another, accidentalism may be interpreted as meaning that this function is many-valued — that two qualitatively identical antecedents may be followed by different consequences — or that it is discontinuous — that a sufficient degree of similarity in the antecedents need not imply any similarity in the consequences. Accidentalism in ethical matters is *indeterminism*. However, many views which are considered as indeterministic merely hold that the *physical* antecedents of a deed are alone insufficient to determine the deed, while the physical antecedents together with the character, motives, conscience and understanding of the agent are adequate for this purpose. Accidentalism in metaphysics is known as *tychism*.

ACCIDENTS, Causes and Prevention of. Industrial Accidents.— For many years modern industry, especially in the United States, has been confronted with the serious problem of preventing injuries, whether avoidable or unavoidable. The avoidable injuries are due to the carelessness of the victim, the employer or a fellow employee, while unavoidable injuries or accidents constitute the occupational risk. The chief causes of preventable industrial injuries are: (1) Lack of provision of safety in construction; (2) excessive hours of labor; (3) unremitting pressure for large output, resulting in the maintenance of too great speed; (4) inadequate factory inspection; (5) failure to remedy known defects; (6) insufficient signal systems or methods of warning; (7) ignorance of workers and the failure of employers to instruct and direct them. The first annual report (1915) of the New York State Workmen's Compensation Commission states that there were not more than 100 cases in a total of 18,930 awards allowed in which the question of intoxication was raised either by the employer or insurance carrier; in not a single case did the commission decide that the injuries were due wholly to intoxication, nor was a single grant disallowed on the ground of intoxication. A Minnesota bulletin assigned 71.6 per cent of industrial accidents to hazards of industry and 5.2 per cent to contributory negligence. The principal causes of accidents were ascribed to "youth, ignorance of the English language, incompetence, carelessness, ranging all the way from momentary inattention or forgetfulness to foolhardy recklessness, personal short-comings, like deafness, or excitability and absorption in the work at hand which make the workman oblivious of approaching danger, fatigue and nerve strain." A Massachusetts report states that "dusty trades, industrial poisons, and occupational diseases are responsible for an annual loss in the United States of $750,000,000, through needless diseases and disablements," and that poor conditions in many factories, mills and shops have a direct bearing upon the number of accidents. The Ohio report of 1915 ascribes the accidents that were passed upon by the commission to the following causes: Falling and shifting objects, 19,606; machinery, 14,018; hand tools and simple apparatus, 5,231; nature of material used or similar working conditions, 4,900; falls, 4,774;

carrying, lifting or handling great weights, 1,196; transportation on tracks, 912; transportation not on tracks, 699; suffocation and asphyxiation, 139; animals, 457; sunstroke and heat prostration, 107; intentional violence of fellow employee, 41; intentional violence of persons not employees, 34.

There are no statistics for the country as a whole relating to industries individually, but the mortality tables of the 1910 census give a fair idea of the accident rate, the statistics covering about 56 per cent of the country's population. Of the males 10 years of age and over, 22,652, grouped in 148 occupations, died through accident, while 881 females of the same ages, grouped in 140 occupations, met the same fate. Among the males one death out of every 10 was accidental, while the ratio among the females was one out of 30. Among steam railway employees there was one death by accident to 1.9 deaths by all causes; among manufacturing laborers one to 8.4; among miners and quarrymen one to 2.5; among persons engaged in agricultural pursuits, one to 15.5; among salesmen, one to 18; and among lawyers, one to 23; while teachers and clergymen appeared to be most free from fatal accidents, the ratios being one to 31 and one to 30 respectively. In the Bureau of Labor Statistics Bulletin 157 (1915) F. L. Hoffman estimates the number of fatal industrial accidents in 1913 at 35,000, while there were approximately 700,000 injuries which resulted in disability for more than four weeks. The ratio of fatal injuries per thousand employees ranged from 4.00 for metal mining, 3.50 for coal mining, 3.00 for fisheries, navigation, lumbering, building and street railway employees to .25 for general manufacturing. In coal mines the number of fatal accidents decreased from 2,785 in 1913 to 2,454 in 1914, the most prolific cause of death being the falling of roofs and coal. The death rate per thousand employees for the entire country was 3.22 in 1914 against 3.73 in 1913. Carl M. Hansen of the Workmen's Compensation Service Bureau places the number of workmen killed annually at 40,000 to 45,000, while the Massachusetts Industrial Accident Board places those killed by accident at 75,000 and the number of those injured annually at 3,000,000.

Legislation and Safety Devices.— Undoubtedly a large proportion of industrial accidents are preventable, if the employer be compelled to make the protection of workmen rather than enormous production his first interest. If accidents constituted a heavy and determinable cost to the business, the employer would quickly realize that the prevention of accidents was to his economic interest. Safe but slower methods of production may result in reduced profits, but the welfare of the community demands that the human waste that is a direct result of the dangerous quicker ways be compensated for by a greater reduction in profits. In the Army and Navy Appropriation bill passed 4 March 1915, Congress inserted a provision prohibiting the employment of the «speeding up» system in government plants. The motive for prevention of accidents can never be compelling until a uniform and unescapable penalty be established for each injury or death. Many of the States have enacted laws for the prevention of work-accidents and diseases, and for the collection of reliable information concerning their nature and extent. Most of the States and Territories have also passed laws compelling the payment of various sums of money by employers for personal injuries to employees causing death or disability for more than two weeks, arising out of and in course of employment, not due to the employee's wilful intention to injure himself or another or to his intoxication. The industries covered, the injuries and persons compensated, and the rates of compensation differ in the various States. Among the laws are the following, with the dates of enactment and amendment:

Alaska: 9 April 1915; in effect 28 July 1915.
Arizona: 8 June 1912; in effect 1 Sept. 1912; new act 13 May 1913; in effect 1 Oct. 1913.
California: 8 April 1911; in effect 1 Sept. 1911; new act 13 May 1913; in effect 1 Jan. 1914; amended 1915
Canal Zone: 24 Aug. 1912; executive order 26 Feb. 1913; in effect 1 March 1913 (suspended); new order 20 March 1914; in effect 1 April 1914.
Colorado: 10 April 1915; in effect 1 Aug. 1915.
Connecticut: 29 May 1913; in effect 1 Jan. 1914; amended 1915.
Hawaii: 28 April 1915; in effect 1 July 1915.
Illinois: 10 June 1911; in effect 1 May 1912; new act 28 June 1913; in effect 1 July 1913; amended 28 June 1915.
Indiana: 8 March 1915; in effect 1 Sept. 1915.
Iowa: 18 April 1913; in effect (a) establishing industrial commission and providing for insurance of employees, 4 July 1913; (b) compensation features 1 July 1914.
Kansas: 14 March 1911; in effect 1 Jan. 1912; amended 10 March 1913.
Kentucky: 23 March 1916; in effect 1 Aug. 1916.
Louisiana: 18 June 1914; in effect 1 Jan. 1915.
Maine: 1 April 1915; in effect 1 Jan. 1916.
Maryland: 16 April 1914; in effect 1 Nov. 1914.
Massachusetts: 28 July 1911; in effect 1 July 1912; amended 1913, 1914, 1915.
Michigan: 20 March 1912; in effect 1 Sept. 1912; amended 1913, 1915.
Minnesota: 24 April 1913; in effect 1 Oct. 1913; amended 1915.
Montana: 8 March 1915; in effect 1 July 1915.
Nebraska: 21 April 1913; in effect 17 July 1913.
Nevada: 15 March 1913; in effect 1 July 1913; amended 1915.
New Hampshire: 15 April 1911; in effect 1 Jan. 1912.
New Jersey: 4 April 1911; in effect 1 July 1911; amended 1911, 1912, 1913, 1914, 1915.
New York: 16 Dec. 1913; in effect 1 July 1914; amended 1914, 1915, 1916.
Ohio: 15 June 1911; in effect 1 Jan. 1912; amended 1913, 1914, 1915.
Oklahoma: 22 March 1915; in effect 1 Sept. 1915.
Oregon: 25 Feb. 1913; in effect 30 June 1914; amended 1915.
Pennsylvania: 2 June 1915; in effect 1 Jan. 1916.
Porto Rico: 13 April 1916; in effect 1 July 1916.
Rhode Island: 29 April 1912; in effect 1 Oct. 1912; amended 1913, 1915.
Texas: 16 April 1913; in effect 1 Sept. 1913.
Vermont: 1 April 1915; in effect 1 July 1915.
Washington: 14 March 1911; in effect 1 Oct. 1911; amended 1913, 1915.
West Virginia: 22 Feb. 1913; in effect 1 Oct. 1913; amended 1915.
Wisconsin: 3 May 1911; in effect same date; amended 1913, 1915.
Wyoming: 27 Feb. 1915; in effect 1 April 1915.
United States: 30 May 1908; in effect 1 Aug. 1908; amended 24 Feb. 1909, 4 March 1911, 11 March, 27 July and 24 Aug. 1912. (Does not include private employment). New act 7 Sept. 1916; in effect same date.

Most of the laws are enforced through factory inspection, but in many States this inspection is so lax and inadequate that the laws are practically ineffectual. In 1911 Wisconsin created an agency for administrative legislation as to details in safety provisions, resembling the systems in many foreign countries. The law requires the employer to take every reasonable precaution against risk and the industrial commission decides what safety devices the employer shall install in order that his factory may be as nearly free from accidents as possible. The commission is

expected to inform itself of the latest and most improved safety devices and so far as may be practicable to secure their adoption by employers. The success of this law induced Massachusetts and New York in 1913 to provide for similar tribunals. In 1915 Nevada created an industrial commission for the administration of the Workmen's Compensation Act and provided that one of the commissioners should hold the office of labor commissioner for the enforcement of labor laws. In 1915 New York consolidated the workmen's compensation commission and the labor department under an industrial commissioner, the act being in accord with laws in Wisconsin, Ohio and a few other States which have created industrial commissions with powers similar to those exercised by public utility commissions.

Almost all States have enacted laws requiring dangerous machinery to be fenced about, and that every possible means be adopted to protect employees. In 1915 Connecticut and Massachusetts passed laws requiring first aid rooms or emergency kits in all manufacturing establishments where machinery is used. Detailed provisions regulating heating, lighting and ventilating factories and guarding machinery therein were passed in Illinois in 1915, and Missouri in the same year provided for similar regulations in coal and zinc mines. Many cities too have enacted laws with the same object in view. New York city has passed ordinances to prevent unnecessary and reckless loss of life by compelling employers to furnish proper and safe scaffolding, to be more careful in employing men who work in caissons, to institute proper safeguards in the operation of elevators and to enforce the fire prevention law more strictly. The police forces of the various cities are compelling a more strict observance of the traffic regulations with the result that street accidents are being reduced to a minimum.

The various safety appliances could not be here described; suffice it to say that their effectiveness is conclusively proved by statistics published in 1913 by the Department of Labor in a report entitled 'Accidents and Accident Prevention in the Iron and Steel Industry.' The report covered 155 plants, employing 158,604 workers, the accident rate for all plants, per thousand, being 1.86 fatal accidents, 2.72 permanent disabilities and 240.6 temporary disabilities. In those plants where the best systems of accident prevention were installed, the accident rate was 167.1 per thousand, while the rate in the most poorly equipped plants was 507.9 per thousand. The United States Steel Corporation annually spends nearly a million dollars to maintain its safety system, but by so doing has reduced its fatal and disability accidents by about 45 per cent, and its less serious accidents by a still greater percentage. Safety engineering has now become an accepted branch of the science of engineering. One of the motives impelling employers to install or increase their safety appliances has been the differential insurance rates put into vogue by those who issue employers' liability policies.

An International Association of Industrial Accident Boards and Commissions has been formed "to bring into closer relation with one another the various boards and commissions administering compensation laws of the United States and to effect so far as possible unanimity in the administration of such laws and to encourage and give effect to all measures looking toward the prevention of accidents and the safeguarding of plants and machinery." At a convention of the National Safety Council at Philadelphia in October 1915, much time was devoted to the discussion of means for safeguarding machinery; the connection between the consumption of liquor and the number and seriousness of accidents; the necessity of more drastic legislation; the value of physical examination and of other methods of excluding the subnormal and the unfit; and the financial advantages accruing from the use of safety devices.

Railway Accidents and Legislation Regarding.— The result of the installation and application of safety devices appears nowhere more strikingly than in railway statistics. In 1914 there were a total of 192,662 persons injured on steam railways and 10,302 killed, while in 1915 the total was 8,621 persons killed and 162,040 injured. This showed a remarkable reduction over any year since 1900, despite the fact that the number of persons carried one mile in 1915 was 106 per cent greater than in 1900 and the number of tons of freight hauled one mile was about 92 per cent greater. On 31 Dec. 1915 the *Railway Age Gazette* reported that 97,809 miles of railway in the United States were operated under the block signal system, which may account for the increased safety of passengers. Many casualties are due to carelessness of motorists at crossings, though in many cases these are inadequately guarded.

In order to promote safety in railway operation many States have railway commissions that investigate and report accidents themselves while other States require the railways to render their own reports. In general these commissions are empowered to inspect railway property and operation (roadway, bridges, tracks, equipment) periodically or at discretion, to recommend and require repairs and improvements and to report to the governor or the legislature their recommendations and any neglect of them. They are authorized also to require the proper guards at crossings; to regulate the heating and lighting and the carrying of tools in passenger cars; to regulate the speed of trains in cities and near grade crossings and the transportation of explosives and inflammables; to regulate the weight and quality of rails and the style of interlocking devices; to prescribe the number of brakemen and the qualifications and hours of labor of various employees; to impose penalties upon railway employees who become intoxicated while on duty or for neglect of duty which would endanger life or safety.

A number of Federal safety appliance, accident and compensation laws have been passed. The act of 3 March 1901 was superseded by another 6 May 1910 requiring monthly reports of all accidents injuring persons or railway property and authorizing the Interstate Commerce Commission to investigate serious accidents. On 11 June 1906 an act was passed which was later declared unconstitutional and was superseded by the acts of 22 April 1908 and 5 April 1910. These constitute the Federal Employers' Liability Act and hold common

carriers liable for injury or death resulting in whole or in part from the negligence of any of the officers, agents or employees of such carrier, or by reason of any defect or insufficiency due to its negligence, in its cars, engines, appliances, machinery, track, roadbed, works, boats, wharves or other equipment. Workmen's compensation acts are not applicable to cases of employees injured while engaged in interstate commerce traffic and no recovery may be had under them. Other acts are designed to prevent casualties. The original safety appliance act was passed 2 March 1893 but was amended 1 April 1896, 28 June 1902 and 2 March 1903, with the result that now all freight cars must be equipped with automatic couplers and grab-irons, and in each train at least half the cars must be provided with brakes operated from the locomotive. On 6 June 1910 the Interstate Commerce Commission ordered that on all trains operated with power or train brakes at least 85 per cent of the cars should have their brakes operated from the locomotive. By the act of 14 April 1910, as amended 4 March 1911, the Commission is required to regulate hand-holds or grab-irons, hand-brakes, running-boards, sill-steps and ladders on freight cars. Under the joint resolution of 30 June 1906 the Commission is required to investigate the block signal systems and appliances for automatic train control. The railways are required by the act of 30 May 1908 to equip locomotives with ash pans that can be cleaned without an employee going under the locomotive. The use of unsafe boilers and other appurtenances on locomotives and tenders is forbidden by the act of 17 Feb. 1911 (as amended 4 March 1915) and provision was made for the inspection of boilers and their appurtenances by the railways and by inspectors under the Commission's supervision. The transportation of explosives for a time was regulated by the act of 4 March 1909 which superseded the act of 30 May 1908. On 1 Jan. 1910 the law was again amended and the present regulations which have been the result of occasional amendment went into effect 1 Oct. 1914. There is a "Bureau for the Safe Transportation of Explosives and Other Dangerous Articles" which was first instituted in June 1907 and was conducted under the auspices of the American Railway Association, but which now also works in conjunction with and under the authority of the Interstate Commerce Commission. On 4 March 1907 an act became law providing that, save in cases of great emergency, trainmen must have 10 hours off duty after 16 hours of continuous service, and eight hours off after 16 hours of service in any one day. The work of operators, dispatchers and others must be limited to nine hours per day in posts operated continuously, and to 13 hours in other posts.

Steamship Accidents.— The Federal government has full and complete jurisdiction over marine transportation and there is a bureau in the Department of Commerce denominated the Steamboat Inspection Service, whose function it is to supervise steam vessels for the promotion of safety. The service must inspect structural materials for marine boilers and each year must thoroughly inspect the hulls, machinery, boilers and fire apparatus of vessels under its jurisdiction. It is empowered to determine the carrying capacity of vessels, and to promulgate laws for the provision of life-saving devices. Many laws have been passed by Congress regarding marine transportation, the most important of which have been on the statute books since the early days of steam navigation. An important enactment is that of 23 July 1912 amending the law of 24 June 1910 requiring wireless equipment on all vessels, American or foreign, licensed to carry 50 or more persons, navigating the ocean or Great Lakes.

See PHYSICAL ECONOMICS; OCCUPATIONAL DISEASES; LABOR, PROTECTION TO; EMPLOYERS' LIABILITY; WORKINGMEN'S INSURANCE; WORKINGMEN'S COMPENSATION; SOCIAL INSURANCE; ACCIDENT INSURANCE; FACTORIES AND FACTORY INSPECTION; RAILWAY SAFETY DEVICES; MACHINERY SAFETY DEVICES; MINING SAFETY DEVICES; VITAL STATISTICS; LOCOMOTIVE SAFETY APPLIANCES.

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ACCIPITRES (Lat. plural of *Accipiter*, the common hawk), or **RAPTORES.** An order of birds, comprising the birds of prey,— eagles, hawks, owls and vultures. See BIRDS OF PREY.

ACCLAMATION ("calling to"): properly, expressing any judgment of an assembly or a large part of it by shouting: but in usage restricted entirely to a favorable one. The choice of rulers among most early Aryan tribes or nations was by acclamation: the candidate was presented by a previous understanding — among the Vikings raised on a shield in the presence of the chiefs — and acclaimed by the voices of the assembled multitude. In some cases, as with the Poles even quite late in their history, the agreement was only made when the throng had gathered and there were more than one set of acclaimers, often ending in a pitched battle to decide which party preponderated. In the minor divisions of modern political life, voting by acclamation is usual; a ballot being called for only when the parties are so evenly balanced that the preponderance is dubious, or a small majority has great strength of lungs, or the minority wish to make the majority put their position on record, or simply to have the satisfaction of a proved vote. In ecclesiastical councils the vote by acclamation comes first also, the question being put as "*placet*" or "*non placet.*" In private matters, acclamation has been used from early times as an expression of good feeling or enthusiasm, as in the customary "hurrahs," "huzzas" and "tigers," and the "hear, hear" of political assemblies, and the responsive shouts and groans of religious revivals or prayer-meetings. The applause in theatres, etc., being non-vocal does not etymologically belong to the group, but is usually included as having the same intent. It began with genuine applause, an actor closing the play by some word asking for approval of the company — in the Roman theatre, "*Plaudite*" ("applaud ye"), or a poet or orator who recited in public expecting and receiving applause; but the *claque*, in modern French phrase, was very early organized by rich amateurs, who kept bands of paid applauders not only for their own use but to lend to friends. Nero had 5,000 of these, many of them *equites* or knights, to chant his praises at the direction of a professional music-master; they were called Augustiniani. In the modern French theatre the *claque* is on a more modest footing and is paid by the management; the understood reason being (curiously) that it keeps up the spirits of the actors when the audience's coldness might depress them beyond the power to play well, and more rationally that it guides and stimulates the audience itself to genuine applause when it might be simply sluggish and indifferent. In old times applause was shouted at marriages, as "Io Hymen," "Hymenæe," "Talassio"; in festal or religious processions; to victorious commanders in triumphs or ovations, as "Io triumphe"; and even, contrary to modern feelings of decorum, in churches, the pulpit orator being cheered at good passages.

ACCLIMATIZATION, the gradual alteration which fits a plant or animal to a climate differing from that in which the habits of its species or race have been formed. Acclimatization and naturalization are often mistakenly used as synonymous, but naturalization properly means establishment in a new country, and, if the climates of the two countries chance to be the same, acclimatization is not implied. In the consideration of marine animals and plants acclimatization takes on a slightly different meaning, since aquatic life is more affected by the various conditions of the surrounding water than by climate.

In Plants.— Many examples of acclimatization are furnished by cultivated plants, among which the most noteworthy are perhaps the cereals. The original species of most of these has not been discovered, but in most cases it is supposed to have lived in sub-tropical or warm temperate regions. Some of these cereals now thrive far better or are more productive in cold, northern climates than in warm regions. But in such cases an important influence may to a greater or less extent obliterate or emphasize the apparent period of growth, the productiveness, etc. This is the daily duration of sunlight. During the growing period the sunlight lasts longer as the pole is approached, so that the shorter season is more than compensated for by the increased hours of sunlight. It has been found by experiment that certain varieties of corn brought from the southern States to the northern attained their customary height, but generally failed to ripen seed. The progeny of such plants as did mature seed gradually assumed the characteristics of northern varieties; they reduced their height and shortened the time necessary to attain maturity. In a few years they resembled other northern varieties in these two respects. The reverse of this case has also been proved; northern varieties taken to the south at first reached the height and attained maturity in the time natural to them in the north, but gradually assumed the characteristics of southern varieties — increased height and greater number of days to reach maturity. But even considering the frequent preponderance of this influence and remembering that the production of seed is usually in opposition to marked development of vegetative parts, there is no doubt that plants, in becoming acclimatized, are compelled to adjust themselves to many other less prominent influences, such as humidity, temperature, light and wind. The peach is supposed to have come from China by way of Persia, and since early historical times has gradually been fitting itself to more and more northern conditions. It is now found to be a profitabe crop in Michigan and New York, which are several degrees farther north than its supposed place of origin. The influence of climate upon cultivated plants is recognized by progressive agriculturists and horticulturists, and each prefers seed grown in a more northerly locality than his own. The effects of the new environment, however, soon become evident, and new importations must be made. Seeds grown at high altitudes exhibit the same characteristics as those produced in high latitudes; that is, they are hardier and require a shorter period to reach maturity than those grown in low altitudes or low latitudes.

Among naturally acclimatized plants are many remarkable phenomena. Deciduous plants taken from cool climates to tropical conditions hold their leaves for a much longer period than where they are indigenous, or may even become evergreen like their new associates. Plants im-

ported from warm regions to cooler may lose the power to ripen seeds, but this defect may be compensated by the development of vegetative reproductive powers. The reverse case is also true. Southern plants may fail to ripen wood completely, and winter killing may result. In cultivated plants, however, this phenomenon, which is often observed in the peach, may be due to improper methods of cultivation resulting in abnormal wood-development.

In Animals.— The capacity for acclimatization is possessed in very different degrees by different animals, even by different individuals of the same species, and depends much upon general hardihood. Exactly what changes take place during acclimatization is not known; sometimes the very specific gravity of the animal is altered, as when fresh-water fishes become adapted to the denser water of the ocean; similarly, the normal temperature of the individual may gradually become altered, as in the case of fishes native to cool water, which chance to work up-stream into hot springs and live there at a temperature which would kill normal individuals of the same species. The animals which are most widespread over the earth are those which have the greatest adaptability to new climates and new conditions of environment, and the best examples of this adaptability are found among domestic animals (q.v.). About the middle of the 19th century there was much enthusiasm for transplanting animals from one country to another; but the results have so often been harmful rather than beneficial to the recipients of the new forms that the effort to improve on nature in this way has been abandoned. Conspicuous examples are afforded by the sending of the European rabbit to Australia and New Zealand, where it multiplied so excessively in a favorable climate, with abundant food, and through the almost complete lack of enemies, as to become a nuisance and a menace to the pastoral industry. (See RABBIT). The introduction of the agua toads, and afterward of the mungoos (q.v.) into Jamaica, to subdue the rats that were devouring the sugar-cane, had evil results. The spread of the European house-sparrow in the United States is another pertinent example. Many highly injurious insects have been accidentally introduced and acclimatized in America from abroad; and the same is true of other countries. On the other hand a few instances like the acclimatization of the silkworm in Europe, of bumblebees in New Zealand, or of ladybirds in California, have been highly beneficial; while much good has come from stocking new streams with desirable fishes. Of the several societies founded to promote such transferences, that of Paris (Société d'Acclimatation) is most important, but latterly has been inactive.

In Human Beings.— See HYGIENE.

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ACCO, ak'ō. See ACRE.

ACCOLADE, äk'ō-lād' (Fr. "embrace," literally, "on the neck"), in heraldry, the ceremony by which in mediæval times one was dubbed a knight. On the question what this was, antiquaries are not agreed. It has been made an embrace around the neck, a kiss or a slight blow upon the cheek or shoulder. In some cases it was a literal box on the ear, for which later was substituted a gentle tap on the shoulder with the flat of a sword. In conferring Knighthood the King strikes the kneeling subject lightly on the shoulder with a sword and uses the words "I bid thee rise, Sir Knight."

ACCOLTI, Benedetto, äk-ol'tē, ben-a-det'ō, the Elder, Italian jurist: b. Arezzo, 1415; d. Florence, 1466. Several other members of his family were noted for legal attainments. He became professor of jurisprudence in the University of Florence, and on the death of the famous Poggio was made chancellor of that republic. With his brother Leonardo he wrote in Latin a three-volume history of the first crusade, not of great value, but interesting as having furnished Tasso the material for 'Jerusalem Delivered': pub. Venice 1452, Italian tr. 1543, French tr. 1620. He also wrote a volume of biographies of his distinguished contemporaries (Parma 1689).

ACCOLTI, Bernardo, Italian poet and ecclesiastic: b. Florence, before 1466; d. after 1534. He was greatly admired, especially as an improvisatore. Whenever he announced his intention of reciting his verses the shops were closed and the people flocked in crowds to hear him. He was surrounded by prelates of the first eminence; a body of Swiss troops accompanied him; and the court was lighted by torches. Leo X esteemed him highly and made him apostolic secretary, cardinal and papal legate at Ancona. He it was who drew up the papal bull against Luther (1520). Though styled in his own day "The Only (one) of Arezzo" (L' Unico Aretino), the fame of his works perished with him. Their style is hard, his images forced and his taste marred by affectation. The best known is a comedy, 'La Virginia.' His other productions include some lyric poetry, epigrams, octaves and verses in *terza rima.*

ACCOMMODATION, the process by which the mind is brought into adjustment with its surroundings; adaptation.

In physiology, the accommodation of the eye is the function by which objects, near or distant, may be seen distinctly. It is accomplished by the relaxing or contracting of the ciliary muscle. See EYE.

In biology, the process by which an organism becomes adapted to its environment.

In theology, properly, the presentation of a truth not absolutely, but with some modification to suit it either to some other truth or to the person addressed. It is distinguished as *formal* and *material,* the former relating to the method of teaching, and the latter to what is taught. The former includes teaching by parables or symbols, by progressive stages graduated to the capacity of the learner, etc.; more usually, now, the forcing of texts from their obvious meaning to conform them to theories derived from other sources. The latter, as now commonly used, means the theory that Christ and the writers of Scripture modified or perverted the truth to accommodate it to the limited intelligence or the prejudices of their times,— the cosmogonies of Genesis, or Jesus' acceptance of demoniac possession as a truth, etc.

In commerce it usually denotes temporary

financial assistance rendered by one merchant or bank to another. Accommodation paper includes notes or bills of exchange made, accepted or indorsed, without any consideration. While in the hands of the party to whom it is made, or for whose benefit the accommodation is given, such paper is open to the defense of want of consideration, but when received by third parties in the usual course of business it is governed by the same rules as other paper (2 Duer, N. Y. 33; 2 Kent, Comm. 86).

ACCOMPANIMENT, in music, is that part which serves for the support of the principal melody (solo or obligato part). This can be executed either by many instruments, by a few or even by a single one; we have therefore pieces with an accompaniment for several, or only for a single instrument. The principles on which the effect of accompaniment rests are so little settled that its composition is perhaps more difficult than even that of the melody. Frequently the same musical thought produces a good or bad effect, according to the character of the accompaniment, without our being able to give a satisfactory reason for the difference. The accompaniment requires of the performer the most scrupulous study, and of the composer the greatest skill and delicacy. As the object of every musical accompaniment is to give effect to the principal part, the accompanist should always aim really to support and by no means to overpower it.

ACCOMPLICE is the term applied to one who is in some way connected with the commission of a crime, though not as a principal.

In the absence of a statute it is not a rule of law, but a rule of practice only, that a jury should not convict on the uncorroborated testimony of an accomplice. Ordinarily the judge will advise the jury to acquit unless the testimony of the accomplice is corroborated as to the circumstances of the offense and the participation of the accused. It is provided by the N. Y. Code Crim. Proc., § 399, that a conviction cannot be had upon the testimony of an accomplice unless he be corroborated by such other evidence as tends to connect the defendant with the commission of the crime. This statute has been adopted in many of the States of the Union.

ACCORAMBONI, Vittoria, äk-o-räm-bō'nē, vit-ō'rē-a, Italian lady famous for her beauty and her wild tragic history: date of birth unknown; d. 22 Dec. 1585. Her contemporaries thought her the most fascinating woman ever in Italy. Paolo Giordano Orsini, Duke of Bracciano, who was believed to have murdered his wife with his own hand, sought hers with her passionate acquiescence; but her father gave her to Francesco Peretti, nephew of Cardinal Montalto and living in his house. Peretti was assassinated 1581; and Vittoria fled to Bracciano; the scandal was great, and Gregory XIII imprisoned her nearly a year in the castle of St. Angelo, but she married the duke as soon as released. Montalto becoming Pope as Sixtus V, the couple took refuge in Venetian territory. After a few months' residence at Salo on Lake Garda, the duke died, leaving her almost the whole of his great fortune; but an incensed relative of his, Ludovico Orsini, had her murdered at Padua, whither she had removed. This recital, valid on the evidence accessible up to now and accepted by Gnoli in his "Life" of her (Florence 1870), leaves Vittoria much on the level of other passionate Italian women of her age; but the Countess Martinengo-Cesaresco has recently re-examined the evidence in her 'Lombard Studies,' and thinks her innocent of complicity in crime. Much literary use has been made of her story, and Webster's play 'The White Devil' is based on it.

ACCORD AND SATISFACTION signifies a satisfaction agreed upon between the party injured and the party injuring, which when performed is a bar to all actions upon this account. It must be legal. An agreement to stifle a criminal prosecution for a criminal offense such as an assault and imprisonment is void (2 Wils. 241; 5 East, 294).

Where a release is given to one of two joint tort-feasors which recites the receipt from him of a certain sum as full payment, it will operate as a bar to an action against the other tort-feasor (136 Mass. 503).

Accord with satisfaction, when completed, has two effects: It is a payment of the debt; and it is a species of sale of the thing given by the debtor to the creditor in satisfaction; but it differs from it in this, that it is not valid until the delivery of the article, and there is no warranty of the thing thus sold, except perhaps the title; for in regard to this it cannot be doubted that if the debtor gave, on an accord and satisfaction, the goods of another, there would be no satisfaction. But the intention of the parties is of the utmost consequence (30 Vt. 424).

ACCORDION, a musical instrument in the form of a small box, generally from 8 to 12 inches long by 4 wide, and containing a number of metallic reeds fixed at one extremity, but left to vibrate freely. A small bellows, formed by a folding apparatus which unites the top and bottom of the box, supplies the wind, which, admitted by keys acting on valves, sets the reeds in vibration. In the harmonium (q.v.) and the American cabinet-organ the same principle is also employed. The accordion was introduced into America from Germany about 1828 but the principle had long been known in China, and employed for instruments played by the breath. The concertina, flutina and organ-accordion are improvements.

ACCOUNT, a register of pecuniary transactions, whether for personal use, to satisfy a contract, in obedience to law, or as a bill of items sent to a customer who buys on credit. A mutual account is one where debtor and creditor items are opposed between two parties. An open account, or account current, in commerce is one in which the balance has not been struck; in banking, one that may be added to or drawn upon at any time, as opposed to a deposit account, where notice is required for withdrawals. To keep an open account is to keep such a one running on, instead of closing it. A stated account is one which all parties have expressly or by implication (as by the debtor's retaining it beyond a reasonable time without objection) admitted to be correct. To open an account is to begin pecuniary transactions with a banker or merchant.

In law, an account is a detailed statement of the mutual demands in the nature of debt and credit between parties, arising out of contracts

or some fiduciary relations. An open account is one in which some term of the contract is not settled by the parties, whether the account consists of one item or many.

In equity, jurisdiction concurrent with courts of law is taken over matters of account on three grounds: Mutual accounts; dealings so complicated that they cannot be adjusted in a court of law; and the existence of a fiduciary relation between the parties.

ACCOUNTANT, properly any one who keeps accounts, and till lately applied in the United States to all bookkeepers without distinction; more generally now restricted to the head bookkeepers of large houses or corporations, with difficult or complex accounts calling for expert ability. Especially an "expert accountant" or "public accountant" is understood as one not in the employ of any one house, but hiring his services out to such firms or companies, banks or public institutions, as either find their accounts in disorder or wish a legal verification or a guaranteed statement for the public; or report on bankrupt estates under legal process. Few large financial institutions neglect to support public confidence by having their books periodically investigated and reported upon by an accountant unconnected with the concern. This is gradually building up, through many scandals and frauds upon the public, a much higher standard of professional duty among these experts: it is recognized that it is their duty not merely to certify to the correct balancing of the figures submitted to them, but to use reasonable intelligence and honorable purpose on the manner in which those figures were made, and whether they represent facts or gross fictions to deceive outsiders and lure in money to be mishandled. The proper, and in the United States the only, business of an accountant is to examine accounts and make out balance-sheets and statements. In England they assume a still further duty, that of managing estates and legacies.

ACCOUNTING. It is difficult to distinguish between bookkeeping and accounting. In attempts to do so bookkeeping is called the art of recording business transactions and accounting the science. Bookkeeping gives the history of the business in a systematic manner, while accounting classifies, analyzes and then interprets the facts thus recorded and shows the results as losses and gains, leakages, economies, changes in value, etc., in such a way as to reveal the progress or retrogression and the limitations and possibilities of the business. The primary object of bookkeeping is to show debts, both those due to the owner and those due by him to others; the purpose of accounting is to show profits and losses and valuations. Accounting is more than advanced bookkeeping and an accountant is more than an expert bookkeeper. A person might keep a set of books with perfect accuracy by mechanically observing the rules of debit and credit. The accountant must be able to design the set of books and the system of accounts which will give the desired information with the minimum of effort. He must have such a comprehensive view of business, both its economic and legal aspects, that he can not only see the effect of all kinds of transactions on the profit and loss statement and balance sheet, but also recognize and classify all other factors which enter into the determination of the true status of an enterprise. The development and rapid rise of accounting is due to the change from private to corporate form of business organization. The enormous growth of manufacturing, transportation and mining companies, and the investment of their ownership in the hands of many shareholders demands a more accurate determination of profit and loss and valuation of assets than when such enterprises were owned by small private companies. A proper accounting system is an aid to the creditors of a corporation in determining the value of its securities and shows the stockholders whether they are receiving a just share of its profits. Since the charges for service rendered by the public service companies are coming more generally under the regulation of legislative authority, it is essential to know the exact value of the capital upon which dividends must be paid and the true profit which has been earned in order to fix those charges on an equitable basis. This requires a careful classification of items and a regard for certain factors which bookkeeping. as formerly known, did not take into consideration.

Increasing interest in municipal affairs has resulted in the development of accounting systems for cities, counties and States with a view to unifying and classifying their revenues and expenditures so as to show true costs and the comparative efficiency of various departments and changing administrations.

Accounting has made prominent the problem of distinguishing between a revenue expenditure and a capital expenditure. If an item is regarded as a revenue expenditure, it is debited to some expense account and decreases profit; if it is considered a capital expenditure, some real account is debited and the assets increased. For many years the railroads, quite generally, regarded as an expense most improvements in their rolling stock and betterment of their tracks. They charged to operating expenses instead of to construction account the cost of reduction of grades, the replacement of wooden bridges by those of steel, and even the cost of extensions and branches. They claimed that these expenditures for improvements were necessary to hold business against competition and were not simply factors to increase business.

The commonly accepted theory of accounting requires that in so far as any expenditure results in an addition of substantial and permanent character which increases the value of the plant, such expenditure shall be considered an increase in assets and debited to construction account. This is not always upheld by legal decisions but since 1906 the Interstate Commerce Commission has prescribed a uniform set of accounts for railroads engaged in interstate commerce which embodies this principle. It is often difficult to determine whether an expenditure should be considered a real expense or an increase in capital. Sometimes it partakes of the nature of both and has to be divided, as when an old machine is replaced by a new one of an improved and more expensive type.

Accounting recognizes depreciation as a business factor. All machinery used in pro-

duction and even the most fixed assets, as buildings, decrease in value with use, the lapse of time and because of new inventions and improvements. This decrease in value must be considered an expense or cost of production just as much as wages and materials, interest and rent. Consequently, true profits cannot be determined nor the real value of the assets stated until after an allowance has been made for depreciation. In Germany, Austria, France, Switzerland and Belgium, all corporations are required by law to set up a special account to cover depreciation. In England and the United States there is no general regulation but the Interstate Commerce Commission and the State legislatures compel the railroads and certain public service corporations to make such provision. Most large corporations voluntarily do so.

There are various ways of treating depreciation on the books. Sometimes the particular asset is credited with the amount of its decrease, the balance of the account showing its new value. This is called "writing down" the asset. Sometimes the asset is carried at its original cost and a valuation account credited with the amount of the depreciation. The two accounts, taken together, show the actual value of the asset. Since some assets are consumed slowly while others are short-lived, the determination of the proper allowance for depreciation is a difficult problem. Absolute accuracy cannot be attained and even approximate estimates require considerable expertness. Tables applicable to various kinds of machinery and buildings have been worked out from experience.

Fluctuations in the value of fixed assets, as measured by the market price, may be considered as due to causes not under the control of the business. They may be favorable or unfavorable and are often not at all permanent. Usually no consideration is given to them on the books except as there results a depreciation in the value of goods for sale or in the process of manufacture.

Stocks, bonds and the securities of other concerns bought for investment are carried on the books at their original cost, if this is below the market quotations, otherwise the market value is substituted. In Austria, the law requires the use of the market value in case of either depreciation or appreciation. In this country it is considered conservative to disregard appreciation unless the increased value of the asset is actually realized upon by its sale.

Goodwill may be defined as the monetary value placed upon the reputation, connections or advantages possessed by a firm whereby it is able to make unusual profits. In forming consolidations it is often used to represent the difference between the price paid and the intrinsic value of the property acquired. Although a firm may possess or create advantages by which its profits are increased, it is generally agreed that it is bad practice to set up an account for goodwill unless it has been purchased. As to whether goodwill should be considered a depreciating asset and gradually written off the books is a question of dispute among accountants. On account of its intangibility it is regarded conservative to do so.

Cost Accounting is one of the latest developed and most difficult and technical branches of accounting. It is applicable to a manufacturing business rather than to a mercantile or trading concern. The manufacturer buys raw materials, semi-raw materials, parts already finished, etc., and by means of a properly equipped factory and the employment of skilled and unskilled labor, converts these materials into a finished product which he sells. In order to meet competition intelligently and to prepare estimates on work to be performed with accuracy the manufacturer must be able to determine from his records the actual cost of each unit produced during a given period and the cost of goods in process of manufacture at the end of the period. This necessitates the keeping of a class of expenses, known as manufacturing expenses, different from those of a mercantile firm, and the use of many additional ledger accounts.

Three elements enter into the cost of a manufactured article: (1) Raw materials; (2) productive labor; (3) manufacturing expenses. Manufacturing expenses are also called indirect or overhead expenses and include all expenditures outside of those for raw materials and productive labor, such as power, heat, light, factory supplies, taxes, insurance, repairs, depreciation of machinery, etc. Sometimes a fourth element is included — the selling expenses. The first two elements may be called the Prime Cost; the first three the Factory Cost; and all four the Total Cost. But these terms are used to express so many various meanings by the different writers on Cost Accounting as to render a complete discussion too long for this article.

Two of the several general methods of computing costs are: (1) The Production Order Method; and (2) the Process Method. In the Production Order Method an account is opened with each job in the cost ledger. Each job is given a number by which it is always known. Every productive laborer reports the amount of time he spends on it. All material required is requisitioned from the stock room by this number. Thus, the account of each job can be easily debited with the cost of direct labor and the cost of material and parts used. This gives the prime cost of the job and leaves the indirect expenses to be apportioned to it.

The apportionment of the indirect or overhead expenses must of necessity be arbitrary. Many schemes have been suggested but it is impossible to find one that is generally agreed to be logically correct or uniformly accurate. Among the various methods used are: (*a*) The "man-rate" method, which divides up the indirect expenses in proportion to the direct wages paid for the productive labor; (*b*) the "man-hour" method, in which the division is according to the total number of hours of productive labor; (*c*) the "mixed method," which uses the cost of raw materials plus the cost of productive labor as the basis of division; (*d*) the "machine-hour" method; and (*e*) the units of product method. Having decided upon the most practical method of apportioning the manufacturing expenses, the proper amount is debited to each job and the factory cost of that job determined.

The Process Method of determining costs is used when the lots of material in the process of production follow one another in such a way that one lot cannot be distinguished from

another. Each process is known by a name or number, as milling, rolling, annealing, dipping, etc., or, as operation No. 1, No. 2, No. 3, etc. The amount of time of productive labor spent on each process is reported and its cost debited to the account of that process. The cost of raw materials or finished parts used in each process is also debited to its account. The indirect expenses are apportioned by one of the methods described above to arrive at the total factory cost of the process.

Auditing.— Even if not required by law, it has become the custom for most large business firms to have an audit of their records made by outside accountants employed for the purpose of carefully examining their books and certifying to their correctness. It is the duty of the auditor to check up all the entries of the bookkeepers and to compare their amounts with all the original documents and papers, such as checks, notes, bills, receipts, etc., and to discover any errors of principle, of omission or fraud. The auditor's report consists of a profit and loss statement and a balance sheet, with necessary comments and suggestions for increase in efficiency and accuracy of record. In preparing the profit and loss statement the auditor endeavors to make certain that it contains all of the expenses of the period, whether they have been paid or not; that charges properly made against income have not been made against capital; that all the profits earned are included; in short, that the statement is a true report of the income and expense of the period. The balance sheet is the statement of the business most often published and the auditor should be able to certify that the assets are not overstated; that proper allowance has been made for depreciation; that the liabilities are all included.

The auditor may be called in only at the end of a period to make a "complete" audit, or he may be employed to make a "continuous" audit, that is, to check the bookkeeper's work during the period at frequent intervals, so that the statements may be prepared at the end without delay.

Historical.— The practice of accounting was recognized as a profession in Great Britain long before it had attained the highly specialized character it possesses to-day. In 1854 the Society of Accountants in Edinburgh was incorporated by royal charter. Similar societies were established in Glasgow and Aberdeen in 1855 and 1867 and the Institute of Accountants in London in 1870. The New York State Society of Certified Public Accountants was the first to be organized in the United States. In 1896 the New York State legislature passed an act authorizing the State University to confer the degree of C.P.A. (Certified Public Accountant) only on those passing an examination. Many other States have followed this lead. The various State and National societies with their official journals and publications promote the discussion and solution of new problems and methods of practice. During the past few years many colleges and universities, recognizing the importance of accounting and its direct relation to economics, have included its study in their curriculums and greatly developed its literature. Specialists have arisen in the field. Cost accountants and efficiency engineers devise ways and means for cheaper production. System builders organize the accounting of a firm so as to give most satisfactory results. The general expert accountant acts as auditor and "business physician," whose advice is sought whenever unusual conditions arise. See BOOKKEEPING.

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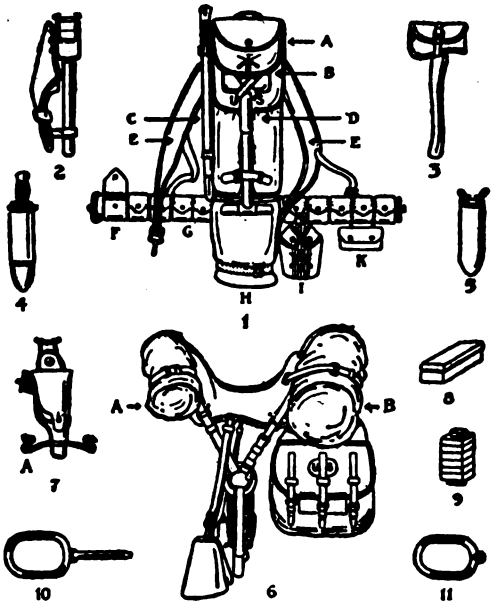
GEORGE M. BRETT,
Department of Political Science, College of the City of New York.

ACCOUNTING, MUNICIPAL. See MUNICIPAL ACCOUNTING.

ACCOUTREMENTS, ą-kōō'tęr-mĕntz, military equipment carried on the person of the soldier or his horse, in particular such as is used to bear his arms and ammunition. In the United States Army the pattern of the infantry equipment was selected by a special board of officers in 1910; that of the cavalry in 1912. Both arms carry extra clothing, a shelter-tent half, a cartridge-belt (suspended from the shoulders), a mess outfit (including bacon-box, condiment-box, knife, fork, spoon, meat-can with cover and cup), a canteen with cover and a first-aid packet. The dismounted troops carry in addition a pack-carrier, slung down the middle of the back, an entrenching tool and a poncho. In the case of the mounted troops these are replaced by a pair of saddle-bags, a saddle-blanket, a set of horse-equipment and a slicker. The infantry entrenching tools are issued as follows: To each squad of 8 men 1 wire cutter (carried by the corporal), 4 short-handled shovels 2 collapsible picks and either an axe or a bolo (a leaf-shaped heavy knife for cutting brush). The bayonet of the infantryman may be carried on his belt, but is now more usually strapped on to the left side of his pack. Those enlisted men and officers who carry pistols carry them in a leather or khaki-colored canvas holster at the right hip and strapped to the leg to prevent swinging. The material of which the pack, bayonet-scabbard, cartridge-belt, canteen-cover, etc., are made is khaki-colored canvas or webbing and the entrenching tools are painted khaki-color. The mess-tin, canteen and cup are aluminum. The accompanying diagram exhibits the respective details of the present issues of infantry and cavalry equipments. The cavalryman is provided with a small box or pouch for revolver-cartridges and a cap-pouch. The sabre-belt, to which all the preceding are attached, consists of a waist-belt, with two rings for the

shoulder-strap and sabre-sling. The usual accoutrements for horse-artillery consist generally of a pistol and cap-pouch and a sabre-belt, which differs from the cavalry-belt only in the omission of the shoulder-strap.



Field Equipment of Enlisted Men, United States Army, Navy, and Marine Corps.

Enlisted Men Dismounted.
1. Full Equipment.
   A. Meat can pouch.
   B. Haversack.
   C. Bayonet.
   D. Entrenching tool.
   E. Suspenders.
   F. Cartridge pocket, open.
   G. Cartridge belt.
   H. Roll (contains blanket, shelter-tent, half, extra clothing).
   I. Canteen.
   K. First-aid packet.

Entrenching tools (carried by some men in place of tool marked D).
2. Pick-mattock.
3. Axe.

Tools (carried on belt by men who carry no entrenching tools).
4. Bolo.
5. Wire cutter.

Enlisted Men Mounted. (They wear a cartridge belt with canteen and first-aid packet attached).
6. Saddle and equipment.
   A. Slicker.
   B. Roll (contains blanket, shelter-tent, half, extra clothing).
   C. Saddle-bag (contains meat can pouch and extra articles).
7. Holster (carried by men equipped with automatic pistol).
   A. Leg-strap. (To prevent swinging).

Contents of meat can pouch.
8. Bacon box.
9. Condiment box.
10. Bottom of meat can.
11. Top of meat can.

ACCRA, or **AK'KRA**, British West Africa, capital of the Gold Coast colony since 1876, a fortified seaport town, the starting point of a railway to the northeastern cocoa plantations and connected with South Africa and Europe by telegraphic cable. Since a destructive fire in 1894, Accra has been almost rebuilt, and in 1896 was raised to the rank of a municipality. The residential section is at Victoriaborg where there is a racecourse, and on the Aquapini hills, at Aburi, 26 miles northeast of Accra, are the government sanatarium and botanical gardens. Pop. including about 200 Europeans, 20,000.

ACCRINGTON, England, a manufacturing town and municipal borough in Lancashire, on the Hyndburn, 20 miles north of Manchester and five miles east of Blackburn; on the Lancashire & Y. Railway; incorporated 1878. It is well laid out, and has various handsome buildings, including the town-hall, a splendid market hall, technical school and school of art, clubs, etc. The manufacture and printing of cottons, chemical works for their use, and the manufacture of spinning and other machinery, are the chief industries. Coal is wrought extensively. Pop. about 47,000. Accrington gives name to a parliamentary division of the county; pop. 84,878.

ACCUM, Friedrich, frēd'riH, German chemist: b. Bückeburg, 1769; d. Berlin, 1838. Removing to London at 24, eight years later he was made professor of chemistry and mineralogy at the Surrey Institution. He published several textbooks on these sciences, but is remembered mainly for being (with an energetic print-seller, Ackermann) the introducer of gas-lighting into England. His 'Practical Treatise on Gaslight' appeared in 1815. Another valuable service to society was his 'Treatise on Adulterations of Food and Culinary Poisons' (1820). As the result of charges against his honesty he returned to Germany, and in 1822 was made professor in the Industrial Institute and Academy of Architecture in Berlin.

ACCUMULATION, in law, the increase of a trust fund by the interest or revenue thereon being added to the principal, for the future benefit of a person or persons. The period of time during which this may be done is limited generally by statute both in England and in the United States to the life of the settlor only or for 21 years or during the minority of the cestui que trust. The common-law rule makes void any disposition of realty for a greater period than a life or lives in being and an additional period of 21 years.

ACCUMULATOR, a device for the storage of energy, more particularly when the energy is supplied from an intermittent source, or when it is to be withdrawn intermittently or irregularly. The fly-wheel on a steam-engine is a device of this sort, but it is not commonly referred to as an accumulator. The word is practically restricted to the following two senses: (1) A storage-battery; (2) a hydraulic apparatus, commonly consisting of a plunger which is fitted to a vertical cylinder and heavily loaded with weights. Water is forced into the cylinder by pumps, with the result that the plunger and its weights are raised, and a considerable quantity of water is thus stored in the cylinder under a high pressure. By the use of such an accumulator it is possible to deliver water for a short time in far greater volume than the pumps feeding the accumulator could deliver it, and yet at the maximum pressure that the pumps are capable of producing. Hydraulic accumulators are used in connection with riveting-machines, cranes and many other heavy tools.

ACCURACY OF FIRE.— The firing for accuracy, whether with artillery or small-arms, involves two entirely separate and distinct con-

ditions: (1) The determination of the personal skill of the individual using the weapon; (2) the determination of the qualities as regards accuracy of the weapon itself. The most common way of determining the relative accuracy of guns is to ascertain their *mean errors in range and deflection* for a given *mean range*, and compare them. It is not always possible to test the practice of guns under precisely similar circumstances.

It is easier to determine, from the practice of the gun itself, a rectangle with which there would be an equal chance of any shot from the gun striking or not striking; or, if a given number of shots were fired, the number which fall within the area. The accuracies of two guns would be in the inverse order of rectangles for the same range. The relative precision of small-arms is decided by various methods. To determine the *centre of impact* the piece should be fixed in a frame and be pointed at the centre of a target stationed at the required distance, and fired a certain number of times, and the positions of the shot-holes, measured in vertical and horizontal directions from the lower left-hand corner of the target, are arranged in tabular form. The sum of all the vertical distances divided by the number of shots gives the *height* of the centre of impact above the origin. Similarly the sum of all the horizontal distances divided by the number of shots gives the *horizontal distance* from the origin to the centre of impact. The co-ordinates of the centre of impact being known, the point itself is known, and its distance from the centre of the target is called the *absolute mean deviation*. This is equal to the square-root of the sum of the squares of its vertical and horizontal distances from the centre of the target. To obtain the mean deviation it is necessary to refer each shot-hole to the centre of impact as a new origin of co-ordinates, and this is done by taking the differences between each tabular distance and the distance of the centre of impact and adding them. The sum of all the distances thus obtained in one direction divided by the number of shots gives the *mean deviation* or *figure of merit*.

The mean horizontal error is found by adding the horizontal distances by which the balls have missed the centre of the target and dividing this sum by the number of balls; this quotient indicates how much the average of the balls have missed horizontally the point aimed at. To get the absolute mean error there are two methods. The first is short and simple, and consists in calculating the hypothenuse of a right angle triangle, in which the other two sides are the mean horizontal and mean vertical errors. The second, which should be called the calculation of the *mean* of the *absolute errors*, consists in measuring for each ball its *absolute error*, a distance from the point aimed at, and to take the mean of these absolute errors by dividing their sum by the number of balls fired. This method is very long, since to have the *absolute error* of each ball it is necessary to square two numbers and then extract the square-root of these sums as the distance of the points struck have been measured upon the vertical and horizontal lines passing through the point aimed at. The results are not exactly the same; the mean of the absolute errors will be greater than the absolute mean error.

The trajectory from the gun to the mean point of impact is called the *mean trajectory*, and the divergencies of the trajectories of particular shots from the mean trajectory have a multitude of independent causes, such as initial angular deviations; variations of the muzzle velocity; variations of the form and weight of the projectiles; variations in the angular position of the gun when it is fired, and in its jump; variations in the force and direction of the wind; and variations in the drift due to rotation.

If the actual mean initial velocity is that for which the sights of the gun are graduated; if the range is exactly known and the sights are set accordingly; if the density of the air is standard; and if there is no wind and no motion of gun or target, then the mean point of impact will coincide with the point at which the line of sight is directed. These conditions, however, are never fulfilled, nor is it possible to compensate exactly for their non-fulfillment, and consequently the mean point of impact is never exactly at the centre of the target. To bring it as near as possible to that point is the object of the *regulation of gun-fire*. See GUNNERY.

ACCUSATION, in law, the charging of a person with a crime, or of a minor offense; the declaration containing the charge of an offense or crime. The term is a broad one, including indictment, presentment, information (qq.v.), and any other form in which the charge of a crime can be made against an individual.

ACCUSATIVE CASE, in Latin,—and thence applied to the corresponding case in Greek and other declensions,—that case of the noun, pronoun, etc., which designates the object to which the action of a verb is immediately directed. It corresponds with what, although the English noun is nearly without declension, is called in English the objective case. See DECLENSION.

ACELDAMA, a-kel'da-ma, a cemetery in Jerusalem used to bury strangers in. The traditional site is on a small plateau half-way up the southern slope of the valley of Hinnom, near its junction with the valley of Jehoshaphat; and it was certainly used in the 6th century for the burial of Christian pilgrims, and continued in use till the 17th. According to Matt. xxvii, 7–8, it was bought by the chief priests and elders for a burial-ground with the 30 pieces of silver returned by Judas after the betrayal; according to Acts i, 19, it was bought by Judas himself with the money, which he did not return, and his bowels burst open in it; according to both, the name means "the field of blood," and it was a potter's field. But as the Greek text gives "*Aceldamach*," which would mean "field of sleep," a natural and beautiful term for a burying-ground, and as, according to Jer. xviii, 2 and xix, 2, there was a potter's house in the valley of Hinnom, it appears that the use and name of the place were very old at the time of Christ, and that the meaning "field of blood" was a misunderstanding, or a play on the real meaning, and its connection with Judas artificial. (History and description by Schick, 1892, quarterly statement of the Palestine Exploration Fund, pp. 283–89).

ACEPH'ALI ("headless"), in civil history, certain levelers, in the reign of Henry I of England, who acknowledged no head or emperor; or, according to another explanation, who were too poor to own any property and so have any legal superior.

In Church history: (1) Bishops exempt from the jurisdiction and discipline of a patriarch. (2) Clergy belonging to no diocese. (3) Those who, on occasion of a dispute in the Council of Ephesus, A.D. 431, refused to follow either John of Antioch or Cyril of Alexandria. (4) Those who rejected the decision of the Council of Chalcedon, 451, on the nature of Christ. (5) In the 5th and 6th centuries, a large section of the followers of the Monophysite, Peter Mongus, who cast him off as their leader because of his accepting a peaceful formula called the Henoticon. They soon afterward split into three parties, the Anthropomorphites, the Barsanuphites and the Essianists, who again gave origin to other sects. (6) The Flagellants (q.v.).

ACEPH'ALOCYST' ("headless cyst"), a growth found in the liver, kidneys and other glandular organs of man and oftentimes those of the lower animals.

ACER, a genus of trees of the family Aceraceæ, containing about 100 species and abundant in north America and eastern Asia. They are natives of the north-temperate regions. The most widely-known European species are *A. campestre* and *A. pseudoplatanus*. See MAPLE; WHISTLEWOOD.

ACERATHERIUM, ā-sĕ-ra-thē'ri-um, an extinct rhinoceros which inhabited Europe during the Miocene epoch. It had no distinct horn, whence the name (Gr. *ἀ-* without, *κέρας* horn, *θήρ* animal), but a small boss on the top of the skull indicates a rudimentary horn or callosity. American fossil hornless rhinoceroses formerly referred to this genus are now distinguished as Cænopus.

ACERBI, Giuseppe, ä-chĕr'-bē, ju-sep'-a, Italian traveler and scientist: b. near Mantua, 3 May 1773; d. there August 1846. He studied at Mantua, devoting himself to natural science; in 1798 journeyed through Scandinavia, Finland and Lapland, and in 1799 visited the North Cape, the first Italian ever there. On his return he stayed some time in England and published his 'Travels' in English, later having them translated into French and German. He rendered great service to Italian literature by starting in 1816 the *Biblioteca Italiana*, which fought the Accademia della Crusca. Made Austrian consul-general to Egypt in 1826, he contributed valuable articles on Egypt to the *Biblioteca*, and obtained many Oriental objects of interest to European museums. From 1836 till his death he lived at his native place.

ACERRA, a-cherr'a, Italy (the ancient ACERRÆ, admitted to Roman citizenship 332 B.C., plundered and burnt by Hannibal), an episcopal city nine miles northeast of Naples, with which it is connected by railroad, and opposite Mount Somma. It has a cathedral. The inundations of the neighboring Agno formerly made it very unhealthy, but the marshes are now drained. Pop. about 18,000.

ACES'TES, or **ÆGES'TUS,** in Greek legend, son of Crinisus and Ægesta, and king of the country near Drepanum, in Sicily. He assisted Priam in the Trojan war, entertained Æneas during his voyage and helped him to bury his father on Mount Eryx. In commemoration of this Æneas built a city there and called it Acesta.

ACETAL, ăs'ē-tăl. (1) A colorless, pleasant-smelling liquid, formed as a by-product in the preparation of aldehyde from alcohol, and occurring naturally in crude alcohol. Its formula is $CH_3.CH(OC_2H_5)_2$. It boils at 219° F. under ordinary atmospheric pressure. Its specific gravity is about 0.831, and its critical temperature is 490° F. Acetal mixes in all proportions with alcohol and ether. It is soluble in 18 volumes of water at 80° F., and is more soluble at higher temperatures. (2) "Acetal" is also used to signify any one of a group of compounds formed by the combination of one molecule of an aldehyde with two molecules of an alcohol and the elimination of one molecule of water. They are obtained as by-products in the preparation of aldehydes from alcohols, a certain portion of the aldehyde formed combining with the unmodified alcohol.

AC'ETAN'ILIDE (known in the drug trade as antifebrin), a crystalline compound obtained by the action of glacial acetic acid upon aniline (q.v.). Its formula is $C_6H_5NH COCH_3$. It melts at 237° F., and boils at 563° F. without decomposition. It is readily soluble in alcohol and ether and dissolves in hot water, but is only sparingly soluble in cold water. It is given in medicine as a sedative and febrifuge. Its physiological action is similar to that of antipyrin but its administration is considered to be safer. It is a common ingredient of "headache powders," and when taken habitually it is liable to cause cardiac symptoms, cyanosis of the mucous membranes, anæma, heart failure and death.

AC'ETATES, compounds of acetic acid with metals or organic radicals. See ACETIC ACID.

ACE'TIC ACID, an organic acid belonging in the fatty series, and resulting from the oxidation of alcohol. It is important on account both of its extensive use in the arts, and of its properties as viewed from the standpoint of the theoretical chemist. Its formula is $CH_3.COOH$, or $C_2H_3O.OH$. It is a monobasic acid, the hydrogen in the radical CH_3 not being replaceable by a metal or another radical. In its dilute state it has been known for centuries as vinegar, and in strong vinegar the characteristic odor of the acid is quite marked. It is formed naturally in the fluids of many plants, especially trees; in some cases as free acid and in others in combination, usually as acetate of lime or of potassium; also in many organic acetates, and in the oils of many seeds. It is a constituent also of certain animal fluids, as, for example, milk. It may be obtained by the oxidation, decomposition and destructive distillation of many organic bodies. It is produced, as in the manufacture of cider vinegar, by the action of the microscopic plant *Mycoderma aceti*, better known as "mother-of-vinegar," or "vinegar plant," upon weak alcohol In the manufacture of vinegar the alcohol

required for the transformation is present in the cider as the result of a previous alcoholic fermentation. It has been shown that "mother-of-vinegar" has no effect upon pure alcohol; a certain amount of albuminous and mineral matter must be present to serve as food for the plant. A very pure form of acetic acid is prepared by subjecting alcohol to the powerful oxidizing action of spongy platinum hung above it in abundance of air. The platinum absorbs oxygen and alcohol vapor at the same time, and these combine to form acetic acid and water. Acetic acid has also been produced by oxidizing alcoholic liquors by blowing ozone into them. The greater part of the acetic acid of commerce is obtained by the destructive distillation of wood, acetate of lime being a by-product in the manufacture of wood-alcohol. (See WOOD-ALCOHOL, under ALCOHOL). The acetate of lime so obtained may be decomposed by the addition of sulphuric acid, when acetic acid is liberated, or it may be treated in any one of a number of other ways for the recovery of the acetic acid. One of the best methods consists in mixing the commercial acetate of lime with calcium chloride, and concentrating the solution until the compound known as calcium aceto-chloride ($CaC_2H_3O_2Cl.H_2O$) crystallizes out. The crystals so formed are then dissolved in water, the solution is filtered through animal charcoal, 10 per cent more calcium chloride is added, and the operation is repeated to obtain a new crop of purer crystals. These crystals are finally distilled with moderately strong sulphuric acid, when a very pure acetic acid is given off. This is concentrated to the required degree by distilling.

By heating dry acetate of sodium with an equivalent quantity of concentrated sulphuric acid it is possible to obtain acetic acid in a state free from water. The acid so obtained is a colorless liquid boiling at 244° F., and solidifying in prismatic or tabular crystals at about 63° F., into an ice-like mass; from this property the anhydrous acid has been called *glacial* acetic acid.

Acetic acid is uninflammable in its liquid state, but its vapor burns with a fine blue flame, with the production of water and carbonic acid gas. It has a stinging sour taste, and when strong it blisters the skin. It mixes with alcohol and with ether in all proportions and is used as a solvent for resins, essential oils, gelatin, albumen, fibrin and other organic substances, being a useful substitute for alcohol in certain cases on account of its relative cheapness.

The commercial acid is generally very impure, containing more or less of sulphuric acid and sulphates; sulphurous acid; hydrochloric acid and chlorides; and the salts of copper, lead, zinc, tin and arsenic.

Acetic acid is used in the production of the acetates of lead, copper, aluminum and iron; in calico printing; in the manufacture of varnishes; and in domestic economy as vinegar. It has also some medicinal use as an outward application. Its extended solvent properties have already been noted.

Lead acetate (or sugar of lead) and copper acetate (or verdigris) are the most important compounds of acetic acid with the heavy metals. Aluminum acetate and the iron acetates are much used in dyeing. The acetates of lead, potassium and ammonia are also largely used in medicine.

Acetic acid may be formed synthetically by exposing a mixture of one volume of acetylene (q.v.) and two volumes of air to daylight, in the presence of a weak solution of caustic potash. The acetylene is slowly oxidized, combining simultaneously with the caustic potash to form acetate of potash, according to the formula

$$\underset{\text{Acetylene}}{C_2H_2} + O + \underset{\text{Caustic potash}}{KOH} = \underset{\text{Acetate of potash}}{CH_3.COOH}$$

From the acetate of potash so formed the acetic acid can readily be obtained. This mode of formation is of no practical value, but it has a theoretical interest.

The relations of acetic acid with the organic radicals are too numerous and complicated to receive general treatment in the present article. The more important ones are noticed elsewhere. See ALDEHYDE; ALCOHOL; ETHER; VINEGAR, etc.

ACETIC ETHER, or ETHYL ACETATE, a colorless, inflammable liquid having the formula $CH_3.COO.C_2H_5$, or $C_4H_8O_2$, prepared by the action of sulphuric acid upon a mixture of alcohol and acetic acid. It has a specific gravity of about 0.91 and a specific heat of 0.48 and boils at 171° F., under the ordinary atmospheric pressure. It mixes readily with alcohol and with ether and at ordinary temperatures is soluble in about 17 parts of water. See ESTERS; ETHER.

ACETIN, a substance resembling fat in its constitution, obtained by acting upon glycerin with glacial acetic acid. Acetins are known as monoacetin, diacetin and triacetin, according as the acetic acid has displaced one, two or three of the hydroxyl molecules in the glycerin. The formula of monoacetin is $C_3H_5(OH)_2(OC_2H_3O)$; of diacetin, $C_3H_5(OH)(OC_2H_3O)_2$; of triacetin, $C_3H_5(OC_2H_3O)_3$.

ACE'TO-ACE'TIC ACID, a thick acid liquid, having the formula $CH_3.CO.CH_2.COOH$. At 212° F. it splits up into carbon dioxide and acetone. Aceto-acetic ether, or ethyl aceto-acetate, has the peculiar property of reacting either as $CH_3.CO.CH_2.CO.OC_2H_5$ or as $CH_3.C(OH):CH.COOC_2H_5$.

AC'ETONE. (1) A limpid, mobile liquid with a taste suggestive of peppermint. Formula, $CH_3CO.CH_3$. It occurs in crude wood-alcohol, from which it can be separated by distilling over calcium chloride. It is also obtained by the destructive distillation of acetates, notably those of barium and lead. It occurs in the urine, blood and brain of calcium diabetic patients. Lieben's test for acetone in the urine is as follows: Distilled urine is made alkaline by caustic potash and a few drops of a solution of iodine and iodide of potassium are added. If acetone is present a yellow precipitate of iodoform is formed at once; if alcohol be present in the distillate, the same reaction takes place, but more slowly; but with acetone the reaction is immediate. Acetone is very inflammable and burns with a white smokeless flame. It boils at 133° F. at ordinary atmospheric pressure; its specific gravity at ordinary temperatures is about 0.800. Acetone is a valuable solvent for scientific and technical pur-

poses. One of its most important uses is the solution of acetylene (q.v.) (2) Any one of a certain class of carbon compounds in which two alcoholic radicals are united by the group CO. These compounds are now called ketones to distinguish them from the particular member of the group defined in (1), above.

AC'ETONI'TRILE, a colorless liquid with a pleasant ethereal odor and burning with a reddish-bordered flame. It has the formula C_2H_3N, and is isomeric with methyl cyanide. It is best prepared by distilling a mixture of potassium cyanide and potassium-methyl-sulphate. It boils at 178° F. at ordinary atmospheric pressure and has a specific gravity of 0.79. It mixes with alcohol and water.

AC'ETYL, the radical of acetic acid, its formula being $CH_3.CO$. Acetic acid may be regarded as the hydrate of this radical, its formula being $CH_3.COOH$. Acetyl chloride, $CH_3.COCl$, is obtained by the action of phosphorus trichloride upon acetic acid. Acetyl chloride evolves hydrochloric acid when it is heated with any substance containing the radicals hydroxyl, amidogen or imidogen, and hence it is of importance as a test for these substances.

ACET'YLENE. See COMPRESSED GASES.

ACHÆA. See ACHAIA.

ACHÆI, ak-ī'ē, **ACHAIANS,** ak-ā-yans, or **ACHÆANS,** ak-e'ans, the descendants of the mythical Achæus, son of Xuthus and grandson of Helen; a generic term employed by Homer to designate the whole Hellenic host before Troy, and in poetic use applied to all the Greeks indiscriminately. They appear to have been that branch of the Greeks which inhabited southeastern Thessaly and northern Peloponnesus, and by the Dorian invasion were driven altogether beyond the Corinthian Gulf and cooped into a strip of Peloponnesus along its southern shore, where they were the nucleus of the later Achaian League. See ACHAIA.

ACHÆMENIDÆ, ak'ē-men'i-dē, the Greek name of the Persian dynasty (558–330 B.C.) founded by Cyrus the Great, including Cambyses, Darius I and II, Xerxes, Artaxerxes, etc., and ended by Alexander the Great. The family took its name from an ancestor of Cyrus, found in Persian inscriptions as Haxamanisya, which the Greeks softened to Achæmenes (a-kē'men-ēz).

ACHAIA, ak-ā'ya, or **ACHÆA,** ak-ē'a, according to Homer, southeastern Thessaly, where was Phthia, the home of Achilles. In later history, a strip of Peloponnesus along the southern shore of the Corinthian Gulf, rising from the coast to wooded hills abounding in beasts of the chase; the uplands were fertile with grapes, olives and other fruits. The nome called Achaia (including Elis) in modern Greece (pop. 255,000), the northwestern part of Morea with capital at Patras, occupies the same location except along the west coast, on the Ionian Sea. When it first appears in authentic history (Herodotus), it is a confederacy of 12 towns — Pellene, Ægeira, Ægæ, Bura, Helice, Ægium, Rhypes, Patræ, Pharæ, Olenus, Dyme and Tritæa — headed by Helice, and keeping much to itself in Greek affairs. Helice was destroyed by an earthquake and swallowed by the waves 373 B. C., and Ægium succeeded to the hegemony; and at some time unknown Olenus was deserted.

The League took no share in the Peloponnesian war, but the Macedonian supremacy and the dynastic struggles after Alexander's death broke it up altogether. Some of the remaining 10 towns were held by Macedonian garrisons, some by local tyrants, a state of disunion equally gratifying to Macedonia and intolerable to Greek patriots. In 280, when several kings were dead, Macedonia in confusion, and the great Pyrrhus absent in Italy, Patræ and Dyme, the two westernmost towns, formed an alliance; Tritæa and Pharæ joined them; and the new Achaian League, famous in history, which gave southern central Greece more than a century of order and good government, was begun. The cities probably drove out their garrisons or rulers, as later ones certainly did. Five years afterward Ægium expelled its garrison and joined the League; Bura was freed and its tyrant slain by its people and their exiled brethren, and joined also; and Iseas, tyrant of Ceryneia, seeing how events were trending, voluntarily surrendered his position with a guaranty of safety, and annexed the city to the League. Seven towns were now included; and the other three were recovered and annexed not long after. But all were small and poor; fortunately for the League, as it was thought too insignificant to molest, and grew up peacefully and solidly for some 30 years. The chief name in its early history is Markos of Ceryneia, who helped liberate Bura even before his own city was freed, and seems to have been the Washington of the League. But its first entrance into the role of a great Greek political force began with the expulsion in 249 of the tyrant of Sicyon by Aratus of that city, who induced it to join the League; it not only gained thereby the first city outside the old Achaian confederacy, and became more or less Pan-Greek, but gained Aratus, its second founder, and a statesman and administrator of high order, though his jealousy of other leaders and his military incompetency injured it deeply. A still greater accession came in 242, when Corinth expelled its Macedonian garrison and joined; and in 234 Lydiadas, tyrant of Megalopolis, the powerful city founded by Epaminondas, voluntarily resigned his place like Iseas and brought in his city, being made commander-in-chief of the League's army the next year. Before the century had begun its last quarter the League included all northern and central Peloponnesus, and many towns elsewhere.

The League was a federal union of absolutely independent states, each having equal power in the Council, which met twice a year — at first and for a long time in a grove near Ægium, but later, at Philopœmen's motion, in the League cities in rotation. The vote of each city was given as a unit, not by elected delegates, but by any of its citizens who were present, any one over 30 having a right to be so; attendance therefore naturally fell to the richer citizens with means and leisure, and the assembly was a rough representative body of the leading men. The union acted as a unit in foreign affairs, and there was a secretary to record the debates and resolutions. The head officer was the *strategos,* who was commander-in-chief and civil president at once; he had under him a *hipparchos* (cavalry commander)

and *nauarchos* (admiral), and a board of 10 *demiourgoi* as assistants in the Council.

The League of course had its internal feuds and discordances of policy; and the Ætolian League north of the Gulf (only half Greek, and wholly barbarian in instability and lack of pro-Greek feeling), which alternately allied itself with it and ravaged its territory, was a mischievous rival and enemy. But the League would probably have fully held its own till the Romans came, but for Sparta. Cleomenes II had revolutionized that state, which had shrunk into the narrowest of oligarchies and could not maintain its position; he had turned it into a socialistic one, and wished to force the League to join him in a great Peloponnesian union, of which Sparta would be master, imposing both its foreign policy and perhaps its internal organization on the rest, and which would destroy the internal independence of the League and menace the possessions of every property-holder in it. The League was badly defeated by Cleomenes in the field, and was between hammer and anvil; for the only power which could save it was Macedonia, its natural foe and old master, and Antigonus Doson refused to give aid unless the citadel of Corinth, the key of Peloponnesus, held by the League, were given up to him. Aratus felt, however, that the suzerainty of Macedonia, now that the League was strong enough to prevent active tyranny, was a less evil than the mastery of Cleomenes; and by cunning management he induced the League to pay the price asked for Antigonus' help. Cleomenes was crushed at Sellasia, and his Spartan constitution came to an end, and the League became a dependency of Macedonia. Yet Aratus' policy was justified by events so far as the League was concerned; it did not suffer from Macedonian tyranny, though the chance of forming a united Greece was at an end. But that was probably as little possible under Cleomenes as under Macedonia.

In point of fact the destroying enemy was not Macedonia but Rome. Under the noble and able Philopœmen of Megalopolis, soldier and statesman of high rank, the League was prospering and giving the citizens an enviable government. But a pro-Roman policy prevailed, and Philopœmen left the country. In 198 it allied itself with Rome against Macedonia, and this was always the beginning of the end with the other party to a Roman alliance. There were wars against Sparta, and a struggle between Roman and anti-Roman partisans in the assembly, with Roman envoys and intriguers to fan the flames. Finally, in 167, the Romans deported the flower of the Achaian citizens to Italy, many of them being imprisoned, others — as the future historian Polybius (q.v.), then a youth of 18 — kept as hostages but given Roman advantages. The last struggle took place in 146, when Mummius defeated the League at Corinth, and the independence of Greece or any fraction of it was at an end. All southern and central Greece was made a Roman province called Achaia.

The first-hand authority for the League is Polybius, unfortunately extant only in fragments; in some parts he is pieced out by Livy, passages of whose work are often obvious translations from Polybius. In English the one great work is E. A. Freeman's 'History of Federal Government,' nearly all devoted to the Achaian League (London 1893).

ACHAIAN, or ACHÆAN, LEAGUE. See ACHAIA.

ACHAN, or ACHAR, ăĸ'ăn, a Biblical character whose story is found in the Book of Joshua, chapter VII. Israel had been forbidden to take captives or spoil at the capture of Jericho. Achan violated the taboo. Disaster came to Israel. Investigation followed. After he was discovered by lot, Achan confessed. He and his family were stoned and burned and their property was also burned. The family were destroyed as accessories after the fact. This incident has suggested a phrase often used in literature — "there is an Achan in the camp," meaning that some member of the group is not true to his obligations.

ACHAQUA, ä-chä'kwa, a South American Indian tribe probably extinct, though a few hundreds, who lived in the upper Orinoco forests in northeastern Colombia, were still existent in 1850. They were utter savages, practising infanticide beyond the second child, polyandry, and tattooing.

ACHARD, Franz Karl, ăĸ'art, fränts karl, German chemist and physicist: b. Berlin, 28 April 1753; d. 1821. He published in 1780 the results of many and careful experiments on the adhesion of bodies. But later he devoted himself to the development of the beet-sugar manufacture, and after six years of laborious endeavor discovered the true method of separating the sugar from the plant. His process was of enormous service to the countries whom the Napoleonic blockade shut off from the West India sugars. He was afterward director of the class of physics in the Academy of Science in Berlin.

ACHARD, Louis Amédée Eugène, ăsh-ar, loo-ē ąm-ā-dā ė-zhān, French novelist: b. April 1814; d. 25 March 1875. Originally a merchant, he became a contributor to several Paris journals in 1838. After the revolution of 1848 he was active as a royalist political writer; 1848–72 the *Revue des Deux Mondes* brought out almost annually a new story from his pen. He depicts pre-eminently conflicts in family life and society. 'Parisian Letters,' published in 1838 under the pseudonym of "Grimm," made his reputation. Other works of his are 'Belle Rose' (1847); 'The Royal Chase' (1849–50); 'Castles in Spain' (1854); 'The Shirt of Nessus' (1855); 'Chains of Iron' (1867); 'The Viper' (1874).

ACHARNÆ, a-kar'nē, a large town of Attica, where the Thirty Tyrants (q.v.) encamped when they marched against Thrasybulus; and where the Lacedæmonians, under their king Archidamus, pitched their tents when they made an irruption into Attica at the beginning of the Peloponnesian war. Aristophanes, in his comedy 'The Acharnians' — where a citizen of the place, sick of war, ravage and the stoppage of trade, makes a treaty of peace with the Lacedæmonians on his own account — represents the inhabitants as charcoal-makers; and other comic writers stigmatize them as rough and boorish.

ACHATES, ä-kā'tēz, in the Æneid, a friend of Æneas, whose fidelity is depicted as

so exemplary that *fidus Achates* (the faithful Achates) has become a proverb.

ACHEEN. See ACHIN.

ACHELOUS, ak-e-lō'us (now ASPROPOTAMO, "White River"), the largest river in Greece, 130 miles long, and not navigable. It rises on the Pindus range, flows south in a boisterous torrent, forming the boundary between Ætolia and Acarnania, and empties into the Ionian Sea opposite Ithaca. In its lower course it is an alluvial stream, winding in great loops through very fertile and marshy plains; it comes from the mountains heavily laden with fine white mud, which it deposits along its banks and in the sea at its mouth, where it has formed a number of small islands.

In Greek legend, the son of Oceanus and Terra, or Tethys, god of the river. As one of the numerous suitors of Dejanira, daughter of Œneus, Achelous entered the lists against Hercules, and, being inferior, changed himself into a serpent and afterward into an ox. Hercules broke off one of his horns, and Achelous, being defeated, retired into his bed of water. The broken horn was given to the goddess of plenty.

ACHEN, Johann ("Hans") **von,** ä'HEN, yō'hän fon, or **ACKEN,** ä'ken, German painter: b. Cologne, 1512; d. 1615. He studied at home, and at Venice under Kaspar Rems, and took service with the Bavarian court 1590; later went to Prague at the invitation of Emperor Rudolph II. The Protestant church at Cologne contains his 'Crucifixion,' the cathedral at Bonn his 'Entombment,' and among his other works are 'Christ Raising the Widow's Son,' and 'Truth Victorious under Protection of Justice.'

ACHENBACH, Andreas, ä'HEN-bäH, German landscape and marine painter: b. Cassel, 1815; d. 1910. He studied under the eminent Schadow at Düsseldorf, and became one of the leading artists of that school. He painted in Holland, along the Rhine, and in Norway, producing landscapes of rich coloring and intense realism. He was made R.A. in Berlin, and knight of the Legion of Honor in France; and took a first medal in Paris, 1855. Private galleries in the United States have many of his finest works.

His younger brother OSWALD, b. Düsseldorf, 1827: d. 1 Feb. 1905, was also a landscape artist, esteemed of more ideal quality than Andreas; and his pictures of Switzerland, Italy, etc., were largely bought in the United States. Consult Achenbauch, C., 'Andreas Achenbach in Kunst und Leben' (1912).

ACHENE, ACHENIUM, AKENE, a-kēn', etc. ("not gaping"), a dry, hard, one-seeded fruit in which the wrappings of the seed set closely to it, forming almost a coat. The entire family of *Compositæ* are of this sort: the "seeds" of borage, the sunflower, thistle, dandelion, etc. Sometimes they are grouped on a common receptacle, called an *etærio*; as in the strawberry, where it is fleshy, the achenes being the "pits," or in the centre of the buttercup, where they form the "fruit"; sometimes they are inclosed in the fleshy tube of the calyx, as in the rose.

ACHENSEE, ä'HEN-zā, a lake in northern Tyrol, Austria, 5½ miles long by ½ mile wide, 20 miles northeast of Innsbruck. Its shores are of great beauty, and it is a noted summer resort, having many hotels and private villas, while steamers carry passengers to points of interest.

ACHENWALL, Gottfried, ä'HEN-väl, got'frēd, German statistician: b. Elbing, 20 Oct. 1719; d. Göttingen, 1 May 1772. He studied at Jena, Halle and Leipzig, and became professor of philosophy, and later of law, at Göttingen. In economics he belongs to the school of "moderate mercantilists"; but it is in statistics that he holds a really high place. The work by which he is best known is his 'Constitution of the Present Leading European States' (1752). In this he gives a comprehensive view of the constitutions of the various countries, describes the condition of their agriculture, manfactures and commerce, and frequently supplies statistics in relation to these subjects. German economists claim for him the title of "Father of Statistics"; but English writers dispute this, asserting that it ignores the prior claims of Petty and other earlier writers on the subject. He gave currency to the term *Staatswissenschaft* (politics), which he proposed should mean all the knowledge necessary to statecraft or statesmanship.

ACHERON, åk'ę-ron, the ancient name of several rivers in Greece and Italy, all connected by legend with the lower world. The principal was a river of Thesprotia in Epirus, which passes through Lake Acherusia, receives the Cocytus (Vuvó), and flows into the Ionian Sea south of the promontory of Chimerium, at Glycys Limen or Elæa, now Port Fanari. At one part its course lies between mountains rising precipitously to the height of 3,000 feet. The name is also given to a river of Elis, a tributary of the Alpheus, and to a small river of Bruttium, in Italy, near Pandosia (location uncertain), near which Alexander of Epirus fell in battle against the Lucanians and Bruttians (326 B.C.). Their legendary celebrity appears to have been originally due to the Acheron in Thesprotia. This country being regarded by the Greeks as the end of the world in the West, they supposed the entrance to the lower world to be here. As this district became better known, the legendary river was placed elsewhere, and finally transferred to the lower regions. In Homer, Acheron is represented as a river of Hades. According to later traditions a son of Helios and Gæa or Demeter, who bore this name, was changed into an infernal river as a punishment for giving drink to the Titans during their war with Zeus. The Etruscans are said to have worshipped Acheron. The name of Acheron was ultimately used in a poetic or figurative way to designate the whole of the lower world.

ACHERONTIA ATROPOS. See DEATH'S HEAD MOTH.

ACHESON, ăch'ē-sŏn, **Edward Goodrich,** American inventor: b. Washington, Pa., 9 March 1856. At 18 he was engaged with a civil engineering corps, opening mines and laying railroads in the vicinity of Reynoldsville, Pa. Upon the termination of his work in railroad construction he designed a small dynamo, and after meeting many discouragements he secured a position at Edison's establishment at Menlo Park, where his ability speedily attracted the attention of Thomas A. Edison. He was pro-

moted rapidly, given every opportunity for the exercise of his inventive faculty and was sent to Europe as first assistant engineer for the Edison interests at the Paris International Electrical Exposition. Mr. Acheson declined an executive position offered him by Mr. Edison in order to pursue individual research and, after a series of unsuccessful inventions, he brought out an anti-inductive telephone wire. In 1886 he removed to Pittsburg, where he succeeded in interesting capital in his schemes. In the same year Mr. Acheson concerned himself with the synthetic production of rubber, as prelude to the more important field of artificial abrasives which now engaged his attention. While passing natural gas into a highly heated furnace containing some clay articles, he found these, after cooling, to be impregnated with carbon and, he believed, rendered harder in consequence. Experiments with a mixture of clay and coke heated electrically failed to produce the result for which Mr. Acheson was striving, but on the end of the arc carbon carrying the electric current into the mixture he discovered a bright speck. Testing this substance he discovered that it would not only cut glass as readily as a diamond, but would cut diamonds as well. On 21 Sept. 1891, the Carborundum Company was formed. At first carborundum was so expensive that it could compete only with diamond powder, used for polishing gems, but after extended work the price was reduced, and about 1899 he invented a graphite (Acheson-graphite), superior to the natural product. The emery wheel manufacturers declared their ability to turn carborundum into wheels, whereupon Mr. Acheson tried the experiment himself, and secured the contract for grinding the joints of the new Westinghouse electric lamp. The valve grinders next found a great time-saver in carborundum, while new vistas were opened up by the utilization of Niagara Falls for the generation of electric power. Mr. Acheson built a new plant there in 1895, contracting for 1,000 horse power, the largest amount ever used in bulk up to that time. As early as 1895 he had taken out a new patent for the purifying of carbon, the first of a series resulting in the artificial production of graphite.

What is often considered his greatest achievement is the discovery of graphite lubrication. Before he finally met with success here his experiments brought him upon other discoveries of inestimable importance. Making a test of various clays, Mr. Acheson became convinced that the greater plasticity and strength of the imported article over the home product was the result of a natural addition of organic matter. Experiments along this line showed him that a treatment with a dilute solution of tannin would produce the same results. Although straw contains no tannin, a liquid extracted from it was found to produce a similar effect, and the clay so treated was called by Mr. Acheson "Egyptianized Clay," and under that name has taken its place on the market as a most important product.

An important discovery of Mr. Acheson's came as the result of an attempt in 1906 to increase the abrasive value of carborundum. Instead of a harder, a softer material was discovered, the ideal lubricating product. A patent of 20 Nov. 1906 secured the perfected process to the International Graphite Company, which is now marketing a mixture of the new graphite with grease under the name of "Gredag." This discovery of the process for making this unctuous graphite led to the greatest invention of all, as by applying to it the treatment which produced "Egyptianized Clay" the discoverer succeeded in rendering the graphite so fine that it would pass through the finest of filtered papers, while it freely diffuses of itself through oil or water. Graphite in this state of fineness is termed "Deflocculated." This graphite diffused in water is called "Aquadag." The advantages of this new lubricant over oil, besides cheapness, are the elimination of viscosity and consequent loss in power, and impossibility of explosion in air compressors. In order to mix deflocculated graphite with oil a process for separating it from the water at this point had to be devised, and this Mr. Acheson met, with the result that he produced the most efficient lubricant known to man, namely, "Oildag."

Besides receiving the Paris and St. Louis Exposition prizes, the University of Pittsburg conferred on him the honorary degree of Sc.D. 12 Feb. 1909; the John Scott Medal was given him by the Franklin Institute of Philadelphia, first for the discovery of carborundum (1899) and again for the manufacture of graphite (1901). In 1907 the American Academy of Arts and Sciences awarded him the Rumford Medals for application of heat in the electric furnace for industrial purposes, and in 1909 the Society of Chemical Industry conferred upon him the Perkin Medal. See CARBORUNDUM; AQUADAG; GRAPHITE; GREDAG; OILDAG.

A CHEVAL POSITION. Military term signifying the position of an army astride a river or other obstacle preventing co-operation of the wings of the army.

ACHILL, äk'il, or **EAGLE ISLE,** Ireland, the largest island off the coast, included in the western county of Mayo. It is of triangular shape about 15 miles long from east to west and 12 miles from north to south; area, 57 square miles. The surface is mountainous, rising in peaks to heights of over 2,200 feet; and the coast line is bold and picturesque. There are several fishing villages, of which Dugort, the principal, has modern hotels to accommodate summer visitors. Pop. 5,000.

ACHILLES, a-kil'ēz, one of the heroes of Greek mythology, and in particular the hero of Homer's Iliad. According to the latter he was the son of Peleus, king of the Myrmidons in Phthiotis, a district of Thessaly, and of the Nereid or sea-goddess Thetis, and the grandson of Æacus; hence often called Peleides and Æacides. He was educated from childhood by Phœnix, a friend of his father, who accompanied him to the Trojan war; and Cheiron the Centaur instructed him in the art of healing. Achilles went to this war with the knowledge that he was to perish in it; his mother having foretold him that he should either live a long and inglorious life, or die young after a glorious career. He led his troops, the Myrmidons, against Troy in 50 ships. During the first nine years of the war we have no minute detail of his actions; in the tenth a quarrel broke out between him and the general-in-chief, Agamemnon, which led him to withdraw entirely from the contest. In consequence the Trojans, who

before scarcely ventured without their walls, now waged battle in the plain with various issue, till they reduced the Greeks to extreme distress. The Greek council of war sent its most influential members to soothe Achilles' anger, and induce him to return to arms, but without effect. Rage and grief caused by the death of his friend Patroclus, slain by Hector, induced Achilles to return to battle. Thetis procured from Hephæstus (Vulcan) a fresh suit of armor for her son, who at the close of a day of slaughter killed Hector and dragged him at his chariot wheels to the camp, but afterward gave the body to Priam, who came in person for it. Achilles then performed the funeral rites of Patroclus, with which the Iliad closes. It contains, however, several anticipative allusions to the death of Achilles, which is also mentioned in the Odyssey. He was killed in a battle at the Scæan Gate.

Here ends the history of Achilles so far as it is derived from Homer. By later authors a variety of fable is mixed up with it; some perhaps old legend, much certainly outright invention. To make him immortal, his mother during his infancy concealed him by night in fire, to destroy the mortal parts inherited from his father, and anointed him by day with ambrosia (the story of Demeter and Demophoön). His father discovering him one night in the fire, Thetis fled; and his father entrusted him to the care of Cheiron, who fed him with the hearts of lions and the marrow of bears, and gave him the education proper to a hero. According to another story Thetis made him invulnerable by dipping him in the Styx, but the heel by which she held him was untouched by the water; accordingly he received his fatal wound in the heel. The story of Siegfried is patterned on this. To prevent his going to Troy, where it was predicted he should perish, Thetis sent him, disguised as a girl, to the court of Lycomedes of Scyros. He was educated with Lycomedes' daughters, one of whom, Deidameia, became the mother of Pyrrhus or Neoptolemus by him. Odysseus (Ulysses) went to the court of Lycomedes to discover him and induce him to join the war, in which Calchas had declared his aid indispensable. He succeeded by a stratagem. Presenting himself as a merchant, he offered the daughters of Lycomedes female ornaments and articles of attire for sale, among which he laid a shield and spear. He then raised an alarm of danger, on which the girls fled, and Achilles seized the weapons. He is said to have been killed either by Apollo in the likeness of Paris, or by an arrow of Paris directed by Apollo. According to another account he made love to Polyxena, a daughter of Priam; and, induced by the promise of her hand on condition of his joining the Trojans, went unarmed to the temple of Apollo at Thymbra, and was there assassinated by Paris. Various stories are told of the relations of Achilles with Iphigenia (q.v.), who was brought to the camp at Aulis on pretext of being married to Achilles. In one account Achilles interferes to rescue her from being sacrificed, and sends her to Scythia; in another he marries her, and she becomes the mother of Pyrrhus. Others say he was united to her in the lower world, where he became a judge; others again say he married Medea in Elysium. Annual sacrifices were offered to Achilles by the Thessalians at Troas by command of the oracle of Dodona; at Olympia and other places in Greece sacred honors were likewise paid to him. This has led to the unsafe inference that he was originally an Achaian god; but remembering the propensity of uncivilized races to deify superior geniuses among them, and such cases as that of Roland, it is much more likely that he was a chief before he was a god. It is probable that a real Thessalian warrior existed who has been thus idealized, though we do not know his name or real deeds. See HOMER; TROJAN WAR.

ACHILLES TATIUS, a-kil'ēz tā'shi-us, a Greek writer of romances: b. in Alexandria; flourished in the 5th century of our era. Suidas says he was a Christian bishop, but this is doubted. He wrote 'The Loves of Clitophon and Leucippe,' an erotic story in eight books, of pleasing but florid style, and without much regard to unity or consistency of plot; it was modeled on Heliodorus' 'Ethiopica.' That the story was very popular in its day is proved by the number of copies of it that are still in MSS., and by the plentiful imitations of it in the Middle Ages. An English translation by Anthony Hodges was published in 1638.

ACHILLES TENDON, a tendon, so called because, as fable reports, Thetis, the mother of Achilles, held him by that part when she dipped him in the river Styx to make him invulnerable. It is the strong and powerful tendon of the heel, which is formed by the junction of divers muscles, and which extends from the calf to the heel. When this tendon is unfortunately cut or ruptured, as it may be in consequence of a violent exertion or spasm of the muscles of which it is a continuation, the use of the leg is immediately lost; and unless the part be afterward successfully united the patient will remain a cripple for life. The indications are to bring the ends of the divided parts together, and to keep them so until they have become firmly united. This tendon is frequently the seat of a synovitis, just above the heel, from excessive exercise.

ACHIMENES, a-kim'e-nēz (from the Greek name of an East Indian plant used in magic), a genus of tropical American plants of the family *Gesneriaceæ,* greatly cultivated in greenhouses for the beauty of their red, white and blue flowers, which, if the rhizomes are potted by the first of April, bloom from the last of May till into October or even November. They may also be propagated by cuttings. The species are numerous.

ACHIN, ACHEEN, or **ATCHEEN,** a-chēn' (properly *Acheh,* Portuguese corruption *Achem,* Dutch *Atjeh* or *Ajeh*), a district at the northwest extremity of Sumatra, till 1873 an independent sultanate, now a province of Dutch Indies: area, 20,471 square miles; pop. (1912) 789,664 (but a true census must be impossible). The surface is divided into an eastern and a western half by a mountain chain which traverses the whole island; rising in the peak of Abong-Abong to 11,000 feet. At the farthest north is the famous Gold Mountain, at the base of which lies the capital. On both sides are numerous stretches of level or undulating soil, watered by small but deep streams, and admirably adapted for tree-culture, gardening and rice. The flora and fauna agree with those

of Sumatra; pepper-trees and areca-nuts grow there. The natives employ themselves in agriculture, cattle-rearing, trade, fisheries, weaving cloth and working in gold, silver and iron. The chief agricultural industry is the production of rice and pepper, the latter sent from many small western ports. From Pedir and other northern ports large quantities of betel-nut are exported to India, Burmah and China. Achin ponies are also much reputed and exported. Minor exports are sulphur, iron, sapan-wood, gutta-percha, dammer, rattans, bamboos, benzoin and camphor, the latter highly valued in China and bringing an enormous price. Silk, once plentiful, has nearly disappeared. Nor is there now much export of the gold that once drew so much trade thither and made it so rich as to astonish foreigners. No place in the East save Japan was so abundantly supplied with it, and it was from far antiquity part of the Golden Chersonese. It exported probably 15,000 to 20,000 ounces a year. The imports are mainly rice (the native supply being insufficient), opium, salt, dried fish, cotton goods, iron and copper wares, firearms, pottery, etc. The people are distinct from the rest of the Sumatrans, who are Malays; they are taller, handsomer and darker, more active and industrious, and good seamen; but they are treacherous, blood-thirsty and revengeful, immoral and inordinately addicted to opium. Their ethnological place is not settled; they are believed to be Malay at root, though probably with some admixture from India, and not impossibly an Arab strain. Their speech is said by some to be Polynesian at root, though with much Malay loan element. Their literature is entirely Malay, and comprises poetry, theology and chronicles.

The capital of the province is Kota Radja or Achin, situated at the northwest extremity, on a stream navigable by boats, about 4½ miles from its port Oleh-leh, with which, since 1876, it has been connected by a railway. Formerly a large and flourishing city, it was almost entirely destroyed during the war, but is now beginning to revive. It contains a Dutch garrison.

History.— Civilization was first introduced into Sumatra by Hindu missionaries in the 7th century, and a considerable amount of immigration from India followed. In the 13th century it was converted to Mohammedanism by Arabs — the sultans of Achin claim descent from the first Mohammedan missionary — and the Arabic alphabet displaced the Japanese. Northern Sumatra was visited by several European travelers in the Middle Ages, as Marco Polo, Friar Odorico and Nicolo Conti; and some of these, as well as Asiatic writers, mention Lambri, a state which must have corresponded nearly with Achin; but the first to name it as such is Alvaro Tellez, a captain of the Portuguese Tristan d'Acunha's fleet, in 1506. It was then a dependency of Pedir adjoining; but within 20 years it had not only gained independence, but swallowed up all the other states of northern Sumatra. It attained the climax of power under Sultan Iskandar Muda, 1607-36, when it extended from Aru, opposite Malacca, round by the north to Padang on the western coast, a seaboard of 1,100 miles; and its supremacy was owned also by the large island of Nyas, and by the continental Malay states of Johor, Pahang, Quedah and Perak. It is in fact the only Sumatran state which has at any time been powerful since the Cape route to the East was discovered. Its wealth astonished the European visitors and traders; and its great commercial repute is shown by the fact that it was to Achin port that the first Dutch (1599) and English (1602) commercial ventures were directed. Lancaster, the English commodore, carried letters from Queen Elizabeth to "the king of Atcheen," James I exchanged letters with Iskandar Muda in 1613, and the Achinese sent envoys to the Dutch republic, who were received by Prince Maurice in camp (1602). But native jealousy of foreigners and the latter's rivalry with and destruction of each other's ventures prevented the establishment of permanent factories there. Still, the trade, though spasmodically interrupted, was very important; foreign merchants of many nations were settled in Achin city port, while other Chinese merchants came annually and held a great fair through June and July. For 58 years after Iskandar's death the Malay oligarchy of chiefs placed females on the throne; in 1699 the Arab party suppressed this system and set up an Arab ruler, and the state rapidly decayed from internal factions. From 1666 on, the Dutch had held possessions around Padang on the western coast, and gradually gained much in old Achin; in 1811 the British seized this as well as the other Dutch East Indies. In 1816 Java was restored to the Dutch, but the English colonies insisted the more strenuously that English influence should be maintained in Achin; and in 1819 the Calcutta government made a treaty excluding all other foreigners from permanent settlements there. In 1824 an exchange was made with the Dutch, of the Sumatran settlements for others in Asia; the above article was not mentioned, but it was privately understood that it should not be insisted on if the Dutch would make no war on Achin. In the convention at The Hague, 2 Nov. 1871, the Dutch insisted on the latter stipulation being formally withdrawn, as the Achinese were pirates and chastisement was often needed; and in 1873 Holland — with plenty of provocation, but grave doubts even at home of its necessity — embarked in the war, which cost it 15,000 lives and about $100,000,000, and ended in 1880 in the real subjugation of the country. Achin city was captured and civil government has been instituted in the coast territory; but the natives are fierce and have a good country for guerrilla warfare, and outbreaks occurred in 1896, 1898 and 1901-04. Many evidences of these wars may be seen in Holland. The authoritative works are all in Dutch; the chief is Snouck-Hurgronje 'De Atjehers' (2 vols., Batavia 1893-95). There is also one of Veth, 'Atchin' (Leyden 1873). For the geography of Atchin consult Volz 'Die Gajoländer' (Berlin 1912).

ACHIKUNDA, an African tribe inhabiting the Lower Shiré, Nyasaland, Central Africa. They are quiet and peaceful, with marked tribal characteristics and are engaged chiefly in agriculture, boating and fishing.

ACHISH, ā'kĭsh, King of Gath in Philistia, with whom David takes refuge when out of favor with Saul; represented as a dull, easy man whom David dupes into believing that he is making war only on the Judahites and their al-

lies, when in fact he is raiding the native tribes, and enriching his stronghold Ziklag with their plunder. His lords are not so blind, however, and make him dismiss David before going to battle at Mount Gilboa. David lived with him four months according to one account, a year and four months according to another.

ACHMET, VEFIK PASHA, Turkish statesman, son of a Greek renegade and a Jewish mother: b. Constantinople, 1818; d. 12 Aug. 1891. In 1834 he accompanied his father to Paris, where he entered the College of Ste. Barbe. Having finished his education in France he returned to Constantinople, where he was given a position in the official translation bureau, of which he soon became the director. He made accurate and detailed knowledge of the Ottoman Empire more easily accessible to Europeans through the publication of his yearbook, 'Salaame, ou Annuaire de l'Empire Ottoman,' which first appeared in 1847. He was later appointed by the Sultan to fulfill many important diplomatic missions abroad and was president of the council and minister of the interior during the Russo-Turkish war in 1877–78. He translated many of the French and German classics into Turkish.

ACHOR, ā'kôr, a valley which forms the northern boundary of Judah (Josh. xv, 7) near Jericho. Its identification is uncertain.

ACHRO'MATISM. Because the several components of a beam of ordinary light are of different refrangibilities, it follows that they are not brought to a common focus by a simple convex lens. The violet rays meet at a point nearer the lens than that at which the red rays unite, and the optical image is confused and fringed with prismatic colors.

The difficulty is greatest with lenses of short focus, whence the early practice of constructing telescopes of enormous length. Sir Isaac Newton, misled by a really remarkable series of petty accidents, concluded that this difficulty could not be obviated, and that large refracting telescopes were therefore impracticable. He therefore gave his attention to the development of the reflector.

In 1757, however, John Dollond, a Spitalfields weaver, discovered that different substances separate the colors of light, for a given mean refraction, to a different degree. He therefore constructed double lenses of two different kinds of glass,— crown glass and flint glass. A concave lens of flint glass brings the colors together while not entirely destroying the refraction caused by a convex lens of crown glass. The correction is far from perfect, however, and even the best telescope lenses produce a blue halo surrounding the stellar images. This outstanding color may be reduced by combinations of three or more lenses; but such devices greatly increase the mechanical difficulties of the optician. The present practice is to bring together such portions of the light as most powerfully affect the eye or the photographic plate, leaving the other tints uncorrected. The introduction of new kinds of glass, especially the Jena glass, so called, has somewhat improved the chromatic correction of smaller objectives. See DISPERSION; LENS; MICROSCOPE; TELESCOPE; LIGHT.

ACHSHARUMOV, Nikolei Dmitriyevich, ăch-shā-roo'mōf, nē-kòlAI dmē-trē-yev'ich, Russian novelist and critic: b. Saint Petersburg, 15 Dec. 1819; d. Moscow, 30 Aug. 1893. For a time he held a post in the ministry of war, but came later to devote himself to painting, and particularly to literature. He first attracted attention by a dramatic sketch, 'The Masked Ball,' and became more widely known through his novels, 'The Double,' 'The Gambler,' 'The False Name,' 'An Unusual Case,' 'The Mandarin,' and 'At All Costs' ('Was es auch Kosten mag'). His critical essays include studies of Tolstoi, Turgeniev, Dostoievski and Herbert Spencer.

A CHULA, ä-shoo'la (Port.), a dance resembling the fandango (q.v.).

ACIC'ULITE, a mineral better known as needle-ore (q.v.).

ACID INDUSTRY, The. The manufacture of chemicals in the United States began with that of sulphuric acid. The indispensable part that this acid plays in all branches of manufacturing created an insistent demand that could not be met by importation. From those early days onward the manufacture of acids has steadily increased until, at the present, the tonnage of acids made annually in the United States exceeds the tonnage of any other one product, excepting only fertilizers, which in themselves contain enormous quantities of salts made with the aid of acids.

In gathering statistics of the acid industry it is customary to place the making of sulphuric and nitric acids and their mixture ("mixed acids") under a separate classification, as the production is so very much greater than of other acids, and their use in general manufactures is so widespread. The Census Bureau in its report on the acid industry for the calendar year 1914 gives the total value of the acids made for sale in the United States at $30,001,364. The amount made and consumed is not valued, but was estimated as worth at least as much more.

Sulphuric Acid.— The number of establishments making sulphuric acid was 194 — including those plants producing it for consumption in their regular business of making fertilizers and explosives, refining petroleum and the manufacture of general chemicals. The total production amounted to 4,047,675 tons, of which 2,337,977 tons were made for sale, in value, $15,395,133 — and 1,709,698 tons for consumption in the factories where produced. In this total all the acid made was reduced to the basis of 50° Baumé. It included 1,677,649 tons of 50° acid; 795,489 tons of 60° acid; 828,466 tons of 66° acid; and 77,758 tons of oleum or fuming acid. Of the establishments reported, 34 were in Georgia, 18 in New Jersey and 16 in Pennsylvania — the location being governed obviously by proximity to deposits of the pyrites needed as raw material. Preliminary official figures of the Geological Survey place the 1916 output of sulphuric acid in the United States at about 4,500,000 tons of 50° acid and nearly 1,000,000 tons of acids stronger than 66° Baumé. The enormous increase over the production of 1914 has nearly all gone into the manufacture of explosives in this country. The exports of sulphuric acid for 1916 were only 30,000 tons.

Nitric Acid.— The manufacture of nitric acid engaged 52 establishments, of which 11

were located in Pennsylvania and 10 in New Jersey. The total output was 78,589 tons, of which 14,685 tons were for sale and 63,904 tons for consumption in the making of other products in the plants where produced. The production sold was valued at $1,591,625.

Mixed Acids.— In 1914 there were 37 establishments making the mixture of sulphuric and nitric acids known to the trade as "mixed acids," and used so largely in the manufacture of explosives. The total production was 112,124 tons, of which 42,725 tons were for sale, and valued at $2,204,480, and 69,399 tons for consumption by the plants making it. The mixed acid industry showed a notable increase since the previous census of 1909, amounting to 49.4 per cent in quantity. The value, however, increased only 18.5 per cent.

The quantities of the principal raw materials consumed in the manufacture of sulphuric and nitric acids and mixed acids in 1914 were as follows: Sulphur or brimstone, 62,340 tons, costing $1,272,745; pyrites, 918,211 tons, costing $3,928,069; and nitrate of soda, 59,604 tons, costing $2,772,495. In addition, the fertilizer industry used in making acids: 2,041 tons of sulphur; 613,842 tons of pyrites; and 15,134 tons of nitrate of soda. The explosives industry used in making acids: 15,832 tons of sulphur; 25,885 tons of pyrites; and 190,960 tons of nitrate of soda. The petroleum industry used in making acids; 2,035 tons of sulphur and 23,669 tons of pyrites.

Of the less important acids separate reports for 1914 were made as follows:

Acetic Acid was made in 13 establishments, the output amounting to 75,303,375 pounds, of which 70,617,637 pounds was for sale and valued at $1,272,294. The remaining 4,685,738 pounds were for factory consumption. The increase in output since 1909 was 24.1 per cent, but the value of the product was less than in 1909 by 4.8 per cent. The bulk of the production was in Pennsylvania, with Massachusetts and New Jersey second.

Boric Acid was made in 1914 by five establishments whose combined production amounted to 8,590,311 pounds of which practically the whole was for sale, and valued at $588,981. The figures show an advance of 54.5 per cent in the quantity over the production of 1909, and of 99.1 per cent in value.

Citric Acid was made in three establishments in 1914, the combined output being 2,657,840 pounds, valued at $1,516,336. The production was 26.4 per cent greater than in 1909, and its value was greater by 95.1 per cent.

Hydrofluoric Acid was made in nine establishments in 1914, and their combined output was 7,209,248 pounds, of which 5,373,657 pounds, valued at $325,540, were for sale; 1,835,591 pounds were for consumption by the maker.

Muriatic or Hydrochloric Acid was made in 1914 by 31 establishments, the total production being 337,167,882 pounds. Of this, 170,876,878 pounds were made for sale, and valued at $1,348,805; the remainder of 166,291,004 pounds being consumed by the maker. The figures show a decrease of production from that of 1909 by 15.9 per cent, and a decrease of value by 23.3 per cent.

Oleic Acid was made in 1914 by seven establishments, with a total output of 23,187,579 pounds, of which nearly all was for sale, the value being $1,301,353. The increase of production over 1909 was 33.9 per cent, and the increase in value 54 per cent.

Phosphoric Acid was made in seven establishments in 1914, the output being 12,420,191 pounds valued at $680,239 — only 1.9 per cent greater than in 1909.

Stearic Acid was made in 10 establishments in 1914, the combined production amounting to 14,351,404 pounds, valued at $1,242,492. In addition, 608,705 pounds were made and consumed by the maker.

Tannic Acid was made in five establishments, four of which were located in New York. The total output was 853,830 pounds, valued at $287,142.

In addition to these separate reports values are given for the production of "fatty acids" at $206,576, and miscellaneous acids at $1,980,816. This latter classification includes — in the order of the value of their respective outputs — *tartaric, carbolic, picric, salicylic, lactic, oxalic, hydrofluosilicic, pyrogallic, gallic, sulphurous, pyroligneous, hypophosphorous, benzoic* and *arsenic acids.*

ACIDASPIS, ăs'ĭ-dăs'pĭs ("spine-shield"), a small trilobite widely distributed through Silurian and Devonian rocks, whose striking characteristic is the thick setting of the dorsal shield with such numerous and formidable spines that it must have been almost impossible for even much larger enemies to prey on it. The head-shield is entirely different from that of other trilobites, the trilobation being obscured by extra furrows and longitudinal false furrows. The thorax has 9 or 10 segments, each with long lateral spines and two shorter median ones; the small tail-shield in nearly all species also has them; in some a row of slender ones on the sides of the head-shield, and a long one projecting from each posterior angle; and from the middle posterior edge two long ones, straight or curved, often project upward and backward. A few species have the eyes placed, like some crabs and lobsters, on the ends of long, slender stalks, commanding a view in all directions.

AC'IDIM'ETRY. See CHEMICAL ANALYSIS.

ACIDOSIS, a condition of the body due to excess of acid formation or lack of oxidation of the same. It is chiefly seen in the disorder known as diabetes. Acid intoxication results from the direct production of acid substances within the body, or from the administration of acids chiefly inorganic.

The chief acids concerned in acidosis are collectively termed acetone bodies and are: (1) Boxybutyric acid, (2) diacetic acid and (3) acetone. These bodies are formed from carbohydrates, fats or proteids, practically from the fats and proteids however, the amino acids of the latter being the chief sources. The Boxybutyric acid is the starting point of the other two. By oxidation it is converted into aceto-acetic (diacetic) acid and this by losing a molecule of water from its carboxyl group produces acetone. These substances were first found in the urine and later isolated from the blood of patients with acidosis.

The acetone bodies appear normally under conditions of starvation; even abstention from carbohydrates will cause their presence in the

urine. Under pathological conditions acidosis is found in a number of conditions, such as cyclic vomiting of children, pregnancy with vomiting, eclampsia, marked grades of temperature, tuberculosis, asthma, atropine, morphine, carbon monoxide poisoning, and chiefly in the disorder known as diabetes (q.v.).

ACIDS. In popular language, acids are substances of a corrosive nature, with a sour taste when diluted sufficiently to lose their corrosive action on the tongue, capable of turning certain blue vegetable coloring matters, such as litmus, to a red, dissolving metals and forming neutral compounds with alkalies. They are classified generally into two groups: the inorganic and the organic, referring to their origin in the mineral kingdom, or in the vegetable and animal kingdoms. Inorganic acids are rarely found as such in nature, but usually in combinations. A small quantity of nitric and nitrous acids is often present in the atmosphere after thunderstorms, carbonic acid is found in limited extent and over limited areas and hydrochloric and sulphurous acids are detected in the fumes from some volcanic fissures. On the other hand, organic acids are freely distributed throughout the vegetable world — as in all fruits, and to a less degree in the animal kingdom. In modern chemistry an acid is regarded as a salt of hydrogen in which one or more of the hydrogen atoms are replaceable by metallic atoms or by organic radicals. For example, hydrochloric acid (HCl) brought into contact with sodium hydroxide (NaOH) seizes upon the sodium, and releases the hydrogen atom — forming sodium chloride (NaCl) and water (H_2O). An acid containing one such atom of replaceable hydrogen is called monobasic; if it has two such atoms of hydrogen it is called dibasic or bibasic; if three, tribasic; and so on. Hydrochloric acid, HCl, is a familiar example of a monobasic acid; it has only one atom of hydrogen that can be replaced by potassium (for example), with the formation of the single compound KCl. Sulphuric acid, H_2SO_4, is a familiar dibasic acid; with potassium it forms the two compounds $HKSO_4$ (hydrogen potassium sulphate), and K_2SO_4 (normal or basic potassium sulphate). Phosphoric acid, H_3PO_4, is a tribasic acid in which one, two or all three of the hydrogen atoms may be replaced by metals or radicals. In a polybasic acid the hydrogen atoms need not necessarily all be displaced by the same element or radicals; thus microcosmic salt is a phosphate of hydrogen, sodium and ammonium, with the formula $HNa(NH_4)PO_4+4H_2O$. Acids may be formed synthetically by uniting hydrogen with non-metallic substances — as with chlorine, to form hydrochloric acid.

When an acid contains oxygen it is commonly named for the substance that is present with the oxygen and hydrogen in the acid. For example, nitric acid is named for nitrogen, and phosphoric acid for phosphorus. It often happens that the same element forms more than one acid with oxygen and hydrogen. In these cases it is usual to give the termination *-ic* to the one in which the oxygen is present in its highest valency, or combining proportion; and the termination *-ous* when in its next lower valency. For example, H_2SO_4 is called sulphur*ic* acid, while H_2SO_3 is called sulphur*ous* acid. *Hypo* — is used as a prefix where the oxygen is in still lower proportion — as hyposulphurous acid. If the acid contains no oxygen it has the prefix *hydro* — as hydrochloric acid (HCl). When an acid has an unusually large oxygen component it has the prefix *per* — as perchloric acid. When an acid has been deprived of all its water component it becomes an acid *anhydride*. The salts formed by acids ending in *-ic* have the ending *-ate*, such as the acid sulphate of potassium, produced by substituting the metal potassium for one of the hydrogen atoms of sulphuric acid, while those formed by acids ending in *-ous* have the ending *-ite*, as the sulphite of sodium, and the hypophosphite of calcium. Salts are considered by some chemists to be acids in which the hydrogen atom has been replaced by the metals. Organic acids are oxides in the second degree of alcohols and aldehydes, combined with a hydrocarbon. They are distinguished by the presence of the carboxyl group $—CO_2H$, in which the hydrogen atom is replaceable by metals, resulting in salts. When the hydrogen is replaced by alkyl radicles esters are formed. The relative strength of various acids is determined by saturating them with a metallic hydroxide. The proportion taken up by each acid is the measure of its relative strength.

ACIPENSERIDÆ, a family of fishes in the suborder *Chondrostei* (by some called *Acipenseroidei*), comprising the sturgeons (q.v.).

ACIREALE, ä'chē-rā-ä'lā, Italy, an episcopal city of Sicily, nine miles northeast of Catania, at the mouth of the river Acis which flows from Mount Etna. An important trade is carried on in grain and flax; there are manufactures of silk, linen and cotton goods, and the thermal springs dating from Roman days, and the surrounding scenery filled with classic tradition, attract numerous visitors. The grotto of Acis and Galatea, the cave of Polyphemus and the seven Scoglide' Cyclopi or Faraglioni which the blinded Polyphemus hurled at Ulysses, are shown in the neighborhood. Pop. 35,600.

A'CIS, a character of Greek mythology, a handsome shepherd of Sicily, son of Pan and the nymph Symaethis. Beloved of Galatea the Nereid, they were surprised by the jealous Cyclops Polyphemus who crushed Acis to death with a rock. Galatea transformed his gushing blood into the river Acis, which has been famous for its cold waters since the time of Ovid. See ACIREALE.

ACK'ER, Charles Ernest, American inventor: b. Bourbon, Ind., 12 March 1868. He was graduated from Cornell University in 1888, with baccalaureate honors, then began a private practice as electrical engineer in Chicago, which he continued until 1893. He is the inventor of the Acker process of manufacturing caustic soda by the electrolysis of molten salt and he was the first in America to manufacture carbon tetrachloride. He has invented many processes pertaining to chemical and electro-chemical manufacturing. He was awarded the Cresson gold medal by the Franklin Institute, and is a member of many scientific societies.

ACKERMANN, äk'ér-măn, Louise Victorine Choquet, French poet: b. Paris, 20 Nov. 1813; d. Nice, 2 Aug. 1890. Her principal

work, 'Poésiès, premières poésies, poésies philosophiques' (Paris 1874), analyzing and revolting against human suffering in powerful but sombre verse, attracted wide attention. Her last work 'Pensées d'une solitaire' (Paris 1883) contained a short autobiography.

ACKERMANN, Rudolph, German-English publisher and inventor: b. Schneeberg, Saxony, 20 April 1764; d. London, 30 March 1834. In 1775 he opened a print-shop and art-school in the Strand, London, and developed a lucrative business as publisher of *Ackermann's Repository of Arts, Literature, Fashions, etc.,* a monthly periodical of which 40 volumes, illustrated by Rowlandson and other leading artists, appeared up to 1828. In 1825 he published 'Forget-me-not,' the originator of the English annuals; 'The Microcosm of London' (3 vols., 1808–11); 'Westminster Abbey' (2 vols., 1812); 'The Rhine' (1820); 'The World in Miniature' (43 vols., 1821–26); etc. He invented and manufactured waterproof cloth and paper; was one of the first to apply the lithographic process to illustration; and was a pioneer in the use of illuminating gas. In philanthropic work he raised nearly $1,000,000 for German relief after the battle of Leipzig.

ACKNOWL'EDGMENT, the act of one who has executed a deed, in going before some competent officer or court and declaring it to be his act and deed. The function of an acknowledgment is twofold: To authorize the deed to be given in evidence without further proof of its execution, and to entitle it to be recorded. The same end may be attained by a subscribing witness going before the officer or court, and making oath to the fact of execution, which is certified in the same manner, but in some States this is permitted only in case of the death, absence or refusal of the grantor. The certificate should be in substantially the following form:

——— —, 19—.

I, ——— ———, hereby certify that ——— ———, whose name is signed to the foregoing conveyance, and who is known to me, acknowledged before me on this day that being informed of the contents of the conveyance, he executed the same voluntarily on the day the same bears date.

Given under my hand this —— day of ——, 19—.

In many of the States it is necessary that a married woman be examined separately and apart from her husband touching her voluntary execution of the deed, and the fact of such examination must be included in the certificate.

AC'LAND, Lady **Christian Henrietta Caroline Fox,** commonly called "Lady Harriet"; daughter of the first Earl of Ilchester: b. 3 Jan. 1750; d. 21 July 1815. She married Maj. John Dyke Acland, September 1770, accompanied him to America, and shared Burgoyne's campaign of 1777 with him. He being wounded and carried prisoner into the American lines in the second battle of Saratoga, 7 October, she left the British camp by night in a small rowboat and in a driving storm to rejoin him, with her chaplain and two servants; was cordially received by Gates and nursed her husband back to health. Acland reciprocated the kindness when on parole in New York, by helping to relieve the sufferings of American prisoners. He died of a paralytic stroke 2 Dec. 1778; the gratifying story that he was killed in a duel for defending American courage against aspersion being pure invention. Equally untrue is it that she went insane and afterward married Chaplain Brudenell; she died Acland's widow. She was a graceful and elegant woman and is remembered for her charities.

ACLAND, Sir Henry Wentworth Dyke, English sanitarian: b. 1815; d. 16 Oct. 1900. He was long an expert on cholera and the various forms of plague. He was professor of medicine at Oxford (1857–94), besides serving on various sanitary bodies. He was one of the founders of the Oxford University Museum, and with Ruskin published an account of its objects (1859). He accompanied the Prince of Wales to America in 1860. He was author of numerous works on medicine and medical education, among them 'Memoir of the Cholera at Oxford,' in 1854. He was created a baronet in 1890.

ACLIN'IC LINE, an imaginary line on the surface of the earth, at every point of which the magnetic dip is zero. It is irregular in shape, and its shape and position vary somewhat from year to year; but, roughly speaking, it lies close to the equator. See Magnetism, Terrestrial.

AC'MITE, a mineral, in Dana's pyroxene group, crystallizing in the monoclinic system, and having essentially the composition $Na_2O.Fe_2O_3.4SiO_2$. Hardness 6 to 6.5; sp. gr. 3.5; lustre vitreous, inclining to resinous; usual color dark blackish-green or reddish-brown. Occurs in slender lustrous prisms in the elæolite-syenites of Norway, Greenland and Arkansas.

ACNE, ăk'nē. Among the diseases of the skin there is none which is more annoying than this, particularly because of its frequent location upon and disfigurement of the face and because of its common occurrence in young people of both sexes with whom disfigurements of this character are keenly distressing. It also appears upon the scalp, back, chest and shoulders, and in people of all ages. It may be a serious matter in the aged for it sometimes terminates in cancer.

Specifically it is a disease of the sebaceous glands of the skin, due sometimes to retention of their oily, greasy secretion, to the action of certain drugs like the bromides, or to the influence of various kinds of germs which find a lodgment upon the skin. It appears in various forms, as black specks or comedones, as reddened spots, as hardened shot-like points, as elevated conical lumps from a pinhead to a pea in size, as suppurating sores resembling boils, etc. In many instances it terminates in disfiguring scars which gradually become inconspicuous, in stains, or in increase or atrophy of the skin. When the scalp is involved there is dandruff and loss of hair, on the nose and cheeks it gives rise to crusts and scales, and on the face of the aged it may take the form of horn-like masses. Wens and similar tumors of the face and scalp are other forms of this disease.

It may result from indigestion, constipation, bad nutrition, bad habits connected with the sexual apparatus and disturbance of the peripheral nerves. The sebaceous glands which

may be involved in this disease are destroyed, and if they perish in very large numbers the nutrition of the skin to which they have been distributed is of course impaired.

The symptoms are sometimes active and acute and the eruption painful, and at other times the eruption will disappear only to return when provoked by the use of sweets, pastries, fats or other substances which are not easily digested, after an attack of constipation, or after the use of irritating drugs. It is very apt to recur periodically in young women in connection with the function which is peculiar to their sex, especially when there are anatomical defects which prevent its normal performance. Therefore all persons who have a tendency to this disease, for some are immune and some are sensitive just as they are to other diseases, must avoid all things which have an irritative action upon the skin, whether drugs or food, or bad habits; as a rule they must also avoid tea, coffee, alcohol, pork, veal, game, shell-fish, cheese and fats of all kinds, also sweets, nuts, fried and greasy food and hot and imperfectly baked biscuits. The diet must be very simple and nutritious, and include milk, eggs, cereals, fresh vegetables, stale bread or toast, prunes, figs and a minimum of meat and fish. Those foods which have a constipating tendency must be rigidly avoided, and if constipation exists it must be combatted by the systematic and regular use of efficient laxatives, including castor oil, fluid extract of cascara, the salines — Epsom and Rochelle salts, and phosphate of soda, or the saline mineral waters. The old-fashioned sulphur and molasses which was a standard, though disagreeable, household remedy a generation ago need not be despised in the treatment of acne. Exercise is very important and it will tend to equalize the blood circulation and direct to the face its proper share of this vital fluid. The sebaceous glands are far more likely to do their work properly when the face and scalp have an adequate supply of freely circulating blood. Bathing is very important, both for preventing and curing this disease, hot baths being preferable. Applications of very hot water to the face and scalp will frequently be found both agreeable and serviceable. Solutions of alcohol, boric acid, mercury and formaldehyde are often used in the treatment of acne and the X-ray has been found beneficial when used skillfully and cautiously. The most recent mode of treatment, which however is not uniformly successful, consists in the use of autogenous vaccines composed of dead cultures of acne bacilli and staphylococci in a saline solution. A stock vaccine from four to ten million with staphylococci at intervals of one or two weeks is sometimes used successfully. When the eruption takes the pustular form, a polyvalent vaccine of cultures of staphylococcus albuf, citreus and aureus may be used. In all cases it is important that the general health be kept in the best possible condition and that the habits of life be simple and normal. The disease is not a dangerous one and is seldom painful except when the glands become inflamed, but when once acquired it is seldom gotten rid of easily.

ACŒMETÆ, ăs'ē-mē'tē (the "sleepless"), a monastic order of the Greek Catholic Church, who in harmony with the universe and the ceaseless music of the spheres celebrated the divine service of perpetual adoration to God, day and night, through the whole range of the canonical hours and the calendar year. For this purpose they were divided into choirs which relieved each other at regular intervals. The order was founded on the Euphrates in 400 by Alexander, a courtier exile from Constantinople. A mother house, the "Irenaion" or "great monastery" was later founded near Constantinople, followed by the "Studium" in the city which from the 5th to the 7th centuries became "through true piety toward God, to zeal ever on the watch, and to a special gift of the Holy Spirit," a centre of learning as well as devotion, which brought to a culmination the glory of the order. Their influence was considerable on Christianity, and the splendor of their religious services contributed largely to shape the liturgy of the Church. The order declined after excommunication by Pope John II, owing to Nestorian tendencies.

ACOLYTE, ăk'ō-līt (a "follower"). An attendant of the fourth clerical order in the Catholic Church, whose chief duties are to assist the sacred ministers at the Mass and other public services of the Church, to light the candles on the altar, to carry them in procession and during the singing of the Gospel, and to prepare the wine and the water for the sacrifice of the Mass. It is the highest minor order of the Church ranking next to a subdeacon. The office originated about the 3d century. At ordination acolytes receive from the bishop an unlighted candle and an empty cup as symbols of the office. Altar boys are frequently designated as acolytes and perform the duties.

ACOMA, ä-kō'ma, N. Mex. (the old Spanish Acuña or Acuco), in Valencia County, 60 miles southwest of Albuquerque and 15 miles southwest of Lagun. It is an Indian pueblo of 830 people, famed especially for its original site, the "Enchanted Mesa," a rock table 430 feet high, accessible now only by scaling, and of old (traditionally) by spiral stairs cut in the stone, in a deep cleft of the upper portion and along a huge detached fragment leaning against it from the bottom, itself reached by a tall tree or a ladder, furnishing a secure fortress against enemies. The Indian tradition is that a long storm washed the loose earth away from the foot of the lower rock while all the tribe except two women were away in the fields, and it fell over into the plain, leaving the upper portion inaccessible; the women perished, but the remainder of the tribe built a new place on the present site, which is the same as when the Spaniards found it. The essence of the tradition is verified by the finding of an old trail, and of shards, etc., in the talus high around the base. Acoma was visited in 1540 by Alvarado, of Coronado's command, and in 1582 by Espejo, who estimated the population at about 5,000. The Indians under Zutucapan stubbornly resisted the Spaniards, and in 1599 defeated a band of them from Onate's force; later in the same year Zaldivar captured Acoma and slew five-sixths of the inhabitants. A Spanish mission was afterward set up for the small remnant. Consult H. H. Bancroft's 'Arizona and New Mexico' (San Francisco 1889); F. W. Hodge, 'The Enchanted Mesa,' (in *National Geographic Magazine*, Vol. 8, Washington 1897).

ACONCAGUA, ä-kon-kä'gwą (Sp.-Am. pron. kä'wä), Chile. (1) An extinct volcano in the south Andes, on Chilean territory and dividing it from Argentina; one of the highest summits in the western hemisphere, estimated at about 23,000 or sometimes nearly 24,000 feet. (2) A river about 200 miles long rising on the southern slope of the above mountain and emptying into the Pacific 12 miles north of Valparaiso. (3) A central province of Chile, bounded north by Coquimbo, south by Santiago, east by Argentina, southwest by Valparaiso. For route of Trans-Andine Railway, via Uspallata Pass in this province, see SOUTH AMERICA. The valleys are very fertile, vineyards and orchards are plentiful and in summer numerous flocks are pastured on the mountain slopes; figs, nectarines, peaches, etc., are sent to Santiago and Valparaiso. Copper and some silver and gold are found. Area, 5,486 square miles. Pop. about 130,000. Capital, San Felipe.

ACONITE (*Aconitum*), a genus of hardy herbaceous plants of the natural order *Ranunculaceæ*, long known for their poisonous properties. Many of them are of great beauty and several are cultivated, especially the common wolf's-bane or monk's-hood (*A. napellus*), so called from the form of its flowers, characteristic of the genus, which are shaped like a helmet or hood. The United States has also several species growing wild. The wild monk's-hood (*A. uncinatum*) is common in rich, shady soils along the margins of streams as far west as Wisconsin, its blue flowers being one of the marked features of the summer's bloom. Trailing wolf's-bane (*A. reclinatum*), a white-flowered variety, grows in the southern Alleghanies. The winter aconite (*Eranthis*), with yellow flowers, is common throughout the Rocky Mountain regions extending to the Pacific coast. It is perhaps more closely related to the hellebores. These flowers hang clustered round an upright stalk and make the aconite a very imposing plant. Some powerful medicines are prepared from the leaves and roots of monk's-hood. Applied externally they produce numbness of sensory nerves and are used to relieve pain in certain forms of neuralgia and in acute and chronic rheumatism. Given internally they diminish the force and frequency of the heart's action, render breathing slower and are employed in acute fevers and inflammations. A poisonous dose causes cessation of breathing and of the heart's action. Many of the plants of this genus are poisonous; common monk's-hood is very virulent; but the most deadly seems to be the *A. ferox*, the *bish*, or *bikh*, of Nepal. The different species contain different but related alkaloids. See ACONITINE.

ACONITIC ACID (also called equisetic or citridic acid), a tribasic acid having the formula $C_3H_3(COOH)_3$, the calcium salt of which occurs in several plants of the genus *Aconitum* and in the common *Equisetum* or horsetail. The acid itself is most easily prepared by the dry distillation of citric acid. It crystallizes in small four-sided plates which melt and are decomposed at about 406° F.

ACONITINE, a powerful vegetable alkaloid found in the tuberous root of *Aconitum napellus* and other species of *Aconitum*. In its chemical structure it is an acetyl-benzoyl-aconine, $C_{21}H_{27}(OCH_3)_4NO_5\begin{cases}CO.CH_3\\COC_6H_5\end{cases}$ or, expressed in simple form, $C_{34}H_{47}NO_{11}$ (Freund and Beck). However, different formulæ are assigned to it by other authorities. It is one of the most deadly poisons and has been known for hundreds of years. Its action as a medicine was first carefully studied by Stoerck in 1762. When locally applied it produces the constitutional symptoms. Its local use in the form of an ointment is of service in neuralgias. Its primary effect is first to stimulate and then to powerfully depress the central nervous system. It thereby slows the heart and dilates the blood-vessels, causing a marked decrease of blood pressure. It is because of this action that it is so widely used in the acute stages of many affections that are accompanied by a rapid heart and a tense, bounding pulse. Aconite has been called the "vegetable lancet" since it dilates the blood-vessels so, bleeding one into one's own veins, as it were. In poisonous doses it causes nausea, vomiting, cold, clammy skin, very slow weak pulse and breathing and finally paralysis of the heart and respiration and death. Death has taken place in from one to five hours from the root. Doses above three milligrams (1-20 gr.) a day are dangerous; 1-400 gr. is an average dose. Treatment is symptomatic, special attention being paid to the respiration by artificial means, and heart stimulants,— strychnine, etc.

ACONTIUS, in a Greek legend retold by Ovid in his 'Heroides,' a youth of the island of Cea, who went to Delos to see the sacred rites performed by a crowd of virgins in the temple of Diana, and fell in love with Cydippe, a beautiful virgin. Not daring to ask her in marriage on account of the meanness of his birth, he presented her with an apple on which were inscribed these words: "I swear by Diana, Acontius shall be my husband." Cydippe read the words and, feeling herself compelled by the oath she had inadvertently taken, married Acontius. William Morris has used the story in the 'Earthly Paradise.'

ACORDAD, a court established at Queretaro, New Spain (Mexico), for the summary trial of brigands and others. It was suppressed in 1813.

ACORN, ā'kôrn (from the Gothic *akran* — "fruit of the field"—), the saucer-cupped nut or fruit of oak trees. On the Pacific Coast from Mexico to northern California, Indians dry and pound acorns into meal and use it in making bread, and as mush food. In northern Italy and other parts of Europe, acorn meal mixed with grain is also made into black bread which, however, is heavy and indigestible. Acorns dried and ground are also used as a substitute for coffee. Children in many places are fond of eating fresh and sweet acorns. The hogs of the Southern States which feed on acorns with a varied diet of occasional corn are distinguished for the agreeably flavored pork, ham and bacon they yield. Beechnuts and acorns as food for pigs is commonly called mast. The word acorn is also used as a nautical term for the cup-like piece of wood which keeps the vane on the mast-head.

ACORN-SHELL, a barnacle of the family Balanidæ. See BARNACLE.

ACORUS. See FLAG, SWEET.

ACOSTA, Gabriel, ä-kōs-ta, Portuguese philosopher: b. Oporto, 1591; d. April 1640. Of a converted Jewish family, educated a Roman Catholic, his studies led him back to Judaism, and he fled with his mother and brothers to Amsterdam. He again developed heretical opinions, was taken to task by the synagogue, and excommunicated; his writings were confiscated and himself fined; and years of persecution by the Jewish authorities and his family drove him to suicide. Gutzkow made him the hero of his novel 'Die Sadducäer von Amsterdam' (1834), and of his tragedy 'Uriel Acosta' (1846). The work which caused Acosta's excommunication was 'Examen Traditionum Pharisæicarum Collatarum cum Lege Scripta' (1623, in Latin).

ACOSTA, Joaquin, ä-kōs'ta, hooä-kēn', South American soldier and geographer: b. Guachias, Colombia, 29 Dec. 1799; d. there 1852. He was an officer of engineers in the Colombian army, member of the New Granada Convention 1831, later representative in its Congress. In 1834 he explored the Socorro valley to the Magdalena with the botanist Cespedes, and in 1841 traveled from Antioquia to Aserma to study the various Indian tribes. For a time he was minister from New Granada to Ecuador; was *chargé d'affaires* at Washington 20 July to 8 Nov. 1842; and later secretary of state in New Granada. He published at Paris in 1848 a history of the discovery and settlement of New Granada, with a valuable map of his own drawing, the first made since the independence of Colombia; and in 1849, at Paris, a 'Miscellany of New-Granadan Sciences, Literature, Arts, and Industries,' with portraits and map.

ACOSTA, José, ä-kōs'ta, hō-sä', Jesuit and historian: b. Spain, c. 1540; d. rector of Salamanca in 1600. In 1571 he went to Peru, where he spent 15 years, becoming provincial of his order. After two years in Mexico and the West Indies he returned to Spain laden with manuscripts and information, and became a royal favorite. His theological works evinced great learning, but it is by his 'Natural and Moral History of the Indies' that he is best known. The complete work was published at Seville in 1590 and proved the most popular and most satisfactory account of the New World up to that time. An English translation appeared at London in 1604, a reprint of which was issued by the Hakluyt Society in 1880.

ACOUCHI, or **ACOUCHY.** See AGOUTI.

ACOUMETER, ä-koo'mētĕr ("hearing-measurer"), an instrument to determine the acuteness of hearing. It is a small steel bar of uniform pitch, to be struck with a hammer or falling weight with gradations of force.

ACOUSTICS, ä-koo'stĭks, (from *ἀκούειν*, to hear), is the science of the production, propagation and audition of sound. The term sound is sometimes by definition restricted to the sensation involved in hearing, but is never consistently so used. Both by derivation and by common and best usage it should be applied to those aërial or other vibrations which, were they to reach the ear, would produce audition. The term being thus used, sound consists of waves of longitudinal vibration, that is to say of waves of to and fro motion perpendicular to the wave front. Such motion, propagated through an elastic medium with a finite velocity, results in alternate rarefaction and condensation.

A moment's consideration of any source of sound will show it to be of such a nature as to give either a single impulsive blow or repeated blows, usually systematically repeated, to the surrounding medium. In the great majority of cases, and those the more interesting both theoretically and practically, the source of sound consists of an elastic body distorted from its normal shape, and, released, vibrating more or less symmetrically about this normal shape or position. It results from this vibratory motion that a series of impulses is given to the surrounding medium which are periodic, nearly similar in character, and nearly equally timed. These impulses, propagated through the surrounding medium all with the same velocity, follow each other in the form of a train of waves. The distance from a point in one impulse to the corresponding point in the next impulse is called the wave length of the sound. The frequency of these waves as they strike the ear determines the pitch of the sound; the character of the wave in respect to form determines the quality of the sound; while both of these together with the amplitude of vibration and the density of the medium determine the loudness or strength of the sensation.

In respect to pitch sounds audible to the human ear range in frequency from about 24 vibrations per second to 40,000 vibrations. Sounds very much higher in pitch are audible to some animals, the cat for example, while for some animals it is probable that the upper limit is not so high, although in regard to the latter point no reliable data have been secured, the interest of the biologists apparently being to extend the range. In regard to the lower limit in other auditors than man no reliable experiments have been made, and if attempted would be extremely difficult because of the difficulty of distinguishing the reactions due to the mechanical disturbance from the reaction due to true audition,— a difficulty which indeed affects all such experiments, but which is enhanced in the case of the lower limit.

The quality of a sound is determined by the wave form. A pure musical tone is due to simple harmonic motion, a type of periodic motion best described as the projection on a diameter of uniform circular motion, and most familiarly illustrated by the motion of the pendulum of a clock. Perfectly pure tones are rare, the nearest approach being that of a tuning fork reenforced by a resonator. Most musical sounds are far from being pure tones. They may, however, be regarded as a complex of a number of pure tones, each pure tone being then called a partial tone. Of these partial tones the lowest, which is generally though not always predominant, is called the first partial, and the other partial tones in order of their pitch are called the second, third, etc., partials. In many of the more interesting cases such as the tones of the organ pipe, or of a bowed, struck or plucked string, the upper partials are harmonics of the fundamental. The pitch and the relative intensities of the partial tones determine what is called the quality of the sound, the pitch of the whole being usually rated as that of the lowest

partial. When a sound is incapable of analysis into pure tones it is called a noise. In many, indeed it is safe to say that in most, sounds that are classed as noise there is some trace of a predominant note, and of a definite musical pitch which a trained ear can detect.

The loudness of a sound is capable of being variously defined. If by the loudness of a sound is meant physical energy and if the sound is a pure tone then its loudness depends on the amplitude of vibration and the pitch, being proportional to the square of each, and on the density of the medium, to which it is directly proportional. The loudness of a sound is ordinarily defined, however, by the intensity of the sensation which it is capable of producing. Thus defined loudness is a function not merely of the amplitude of vibration and the density of the medium, but of the pitch and the quality as well, and moreover it is a complicated function of each. It is an interesting fact that in man there is a definite sense of loudness which renders it possible to compare, in respect to the intensity of the sensations which they produce, sounds differing in pitch by the whole of the musical scale. Moreover, this sense of loudness is apparently physiological and not dependent on familiarity with the "balance" of any musical instrument, and is to a high degree of accuracy the same for different persons, independent of age, sex or musical training.

Production of Sound.— The best example of the single impulse as a source of sound is an explosion in unconfined and therefore non-resonant space. The result is an approximately single wave. When, however, the explosion occurs in a resonant cavity the result is a note of definite pitch determined by the cavity. Or a single explosion and impulsive wave may result in a train of waves and therefore a sound of definite pitch, by being reflected from uniformly spaced surfaces, such for example as the pickets of a fence. The next simplest source of sound is a siren, long a laboratory instrument, more recently made familiar by use in fog signals and steam whistles. The siren consists of two circular discs, the one fixed, the other pivoted to revolve nearly in contact with it. Both discs are pierced by a circle or by circles of holes through which steam or compressed air escapes as the holes in the two discs come opposite each other.

A straight bar of metal or wood may vibrate either transversely or longitudinally. If distorted transversely it vibrates to and fro through its normal straight form. The simplest form of this transverse vibration is that in which the bar at points one-quarter the total length from either end remains at rest. These points of rest are called nodes and the intermediate part of free vibration is called an antinode. When vibrating in this manner the bar emits its fundamental note, the lowest note of which it is capable if entirely free. The next simple mode of vibration is that in which there are three nodes, or points or rest, at points one-sixth the total length from either end and in the middle. In this case the bar emits a note having twice the frequency of the fundamental and in pitch an octave above it. Continuing in this way a series of simple types of motion may be determined. The notes thus produced have twice, three times, four times, etc., the vibration frequency of the fundamental. Any transverse free vibration of the bar is a combination of these forms, and the sound which it emits is a combination of these notes. In this manner the quality of the sound is determined. If the bar is clamped at one end the lowest note which it emits is an octave lower than the lowest when entirely free; and the higher tones, instead of being two, three, etc., multiples of the fundamental, skip every other one, being three, five, seven, etc., multiples of the fundamental. Touching the bar at any point tends to produce a node at that point and to strengthen the corresponding partial tone, and to diminish the partial tones having antinodes at that point. The exact converse is true in regard to striking the rod. Finally, the frequency of the several notes is proportional inversely to the length, and to the square root of the density, and directly to the square root of the rigidity, other dimensions being the same in each case.

When the rod is rubbed or stroked so as to vibrate longitudinally, either free or clamped at one end, its fundamental and overtones form the same systems as before, but all are of a different pitch, determined now by the length, density and modulus of elasticity. Thus the longitudinal vibrations of the free rod have as vibration frequencies of its overtones all integral multiples of the fundamental. If the same rod is rigidly clamped at one end, its fundamental is an octave lower than the fundamental of the free rod, and the even integral overtones are absent.

A stretched string or wire, so small in diameter in comparison with its length that its rigidity is insignificant in comparison with its tension, vibrates for its fundamental over its whole length with nodes at each end. The first overtone is an octave above this in pitch, the wire vibrating with a node at the centre. The second overtone (third partial) is three times the fundamental in pitch frequency, the wire vibrating with nodes a third of the whole length of the wire from either end. The third overtone (fourth partial) is four times the fundamental in pitch frequency, with nodes at the quarter and middle points. A string set in vibration by any ordinary method vibrates in a more or less complex manner, emitting a sound containing the fundamental and overtones. The overtones present and their relative intensities are determined by whether the string is plucked, struck or bowed, and also by the point of application. The fundamental note emitted by a string is of a vibration frequency equal to the square root of the tension divided by the mass per centimetre of length, divided by twice the length.

If the vibrating elastic solid is in the form of a plate the system of overtones bears a complicated relationship to the fundamental, no longer being integer multiples in vibration frequency. The manner in which the plate vibrates may be shown by sprinkling sand on the plate, the latter being horizontal. When the plate vibrates the sand dances away from the parts of the plate in motion and settles in ridges along the nodes. When the plate is square and emitting its lowest tone the nodal lines traced by the sand form a cross reaching from the centres of the sides. By bowing the plate at different points the plate may be made to vibrate in very complicated forms; the sand figures thus traced often making attractive de-

signs. The production of these various patterns is much guided by touching the plate at various points on the edge with the fingers, thus determining the ends of nodal lines. This experiment was first performed by Chladni, and the sand figures are called after their inventor Chladni's figures. Similar experiments can be carried out on stretched membranes, and one may investigate in this way the vibration of drum heads. The result of such an experiment shows that the quality of sound from a drum depends on the point at which it is struck, and that the upper partials are inharmonics of the fundamental.

Next to the stretched string the most interesting case of a vibrating body is that of a column of air. To a first approximation the problem of the vibration of an air column is as simple as that of a stretched string, but in its practical forms and more accurate solution it is by no means so simple. The vibration of a column of air, according to the theory advanced by Bernoulli, is identical with the longitudinal vibration of a straight bar of metal. If the column of air is in a tube open at both ends, the simplest form of vibration and that in which it emits the lowest possible note is such that the air moves to and fro at both ends having a node at the middle. The first overtone, having a vibration frequency twice that of the fundamental, is produced by the column of air vibrating freely at both ends, vibrating freely at the middle, and having nodes at points one-quarter of the total length of the pipe from either end. The second overtone has three times, the third overtone four times, etc., the vibration frequency of the fundamental. If the column of air is closed at one end the lowest tone which it can emit is an octave below the lowest tone emitted by the same pipe open at both ends. The overtones in this case are three, five, seven, etc., times the fundamental in frequency. The analogy of this with the bar of metal is obvious. It might be added that according to Bernoulli's theory the note emitted by the column of air is such that the sound could travel from the open end to the first node during one-quarter of a vibration. This, only approximately true in the case of the column of air, is very strictly true in the case of the metal rod. It follows from this that the pitch of the note emitted by a column of air can be varied either by varying the length of the column, the pitch being inversely proportional to the length, or by so exciting the air that it vibrates according to the higher forms with nodes nearer the ends. The application of this to musical instruments is very simple. Take, for example, organ pipes of what are called flue stops as distinguished from reed stops. All such organ pipes are, obviously, open at the end at which they are blown. According as they are open or closed at the other end they are called open or closed pipes. Open pipes have nodes at their middle when sounding the fundamental note, while the closed pipes have their nodes at the closed end. A closed pipe is therefore an octave lower in pitch than an open pipe of the same length, accurately according to the theory of Bernoulli, but as a matter of fact only approximately so. In a pipe organ the variation in pitch is accomplished not merely by using open and closed pipes, but principally by using pipes of different lengths. The pipes not uncommonly vary in length from 32 feet to half an inch. In the military trumpet we have an exceedingly simple instrument whose whole available scale consists in the overtones, the particular note being determined by lip tension and wind pressure. In the slide trombone the scale is produced not merely as in the trumpet, but by varying the length by means of the slide. In the cornet the variation in length is accomplished by means of keys turning valves which throw into the length of the pipe or cut out from it short auxiliary convolutions. In the French horn the scale is played not merely by the means adopted in the cornet, but by means of the hand thrust into the bell or flared end, thus partially closing it and so lowering the pitch. In the flute, clarionet and wood wind-instruments generally the variation in pitch is accomplished by opening and closing ports on the side of the tube.

A little more might be said in regard to stringed instruments. The strings are, in general, so narrow that when vibrating they cut through the air, communicating, practically, no motion to the air and therefore emitting, practically, no sound directly. The sound which we hear therefore comes not from the string, but from the sounding boards with which they are always placed in contact. It is thus because the sound which we hear comes from the body of the violin and scarcely at all from the strings directly that its quality depends so much more on the instrument than on the strings with which it is stretched.

Propagation of Sound.— When a sound is produced in free air at a distance from all obstacles it spreads in spherical waves, diminishing as it spreads over greater and greater surfaces, the intensity of the sound diminishing as the wave increases. The area of a sphere being proportional to the square of the radius we have the so-called law of the inverse square of the distance. The velocity of propagation of a sound through a medium is independent of the pitch of the sound or of its loudness and depends only on the nature of the medium — its elasticity and its density. In any medium the velocity of the sound is proportional directly to the square root of the elasticity and inversely to the square root of the density of the medium. Since the waves follow each other with so great rapidity that the air does not have time to cool during compression, the elasticity here referred to is that of adiabatic compression. A table is here given of the velocity of sound in various media:

Carbonic acid gas	866
Air	1,092
Hydrogen	4,190
Water	4,730
Pine wood	10,900
Copper	12,200
Iron	15,700

In this table the velocities given are in feet per second and at 0° C. A variation in temperature produces a variation in the velocity, particularly in the case of gases. A rise in temperature results in an increase of velocity, the increase being about .18 per cent for every degree Centigrade for all gases. This amounts to a little less than two feet per second in the case of air.

When the source of sound is coming toward the observer, the observer being sta-

tionary, the sound as heard is of a higher pitch than if the source were stationary, for the number of waves reaching the observer per second is increased in the ratio of the velocity of sound plus the velocity of the source to the velocity of sound. Similarly when the source is receding from the observer the sound received is of lower pitch. The change is strikingly observed as a bicycle bell or a clanging street car gong passes close by an observer. In this case the fall in pitch is abrupt and marked. Similar phenomena are produced as the observer approaches or recedes from a stationary source. This is called Doppler's principle.

When the sound instead of being produced in uniform and stationary air is produced in air moving with various velocities the phenomena are much complicated. These phenomena were first studied with care in connection with fog signals by Henry, Tyndall, and Stokes. It was an old observation that fog signals plainly audible at a very great distance could often not be heard at a little less distance, still nearer were audible again, still nearer inaudible,— that these regions of silence and audibility varied, not merely on different days, but rapidly in the most mysterious and disconcerting manner, so much so as to receive the name of "sound ghosts." The explanation, for a long time sought in vain, was ultimately given in a suggestion by Stokes that they were due to a variability in the velocity of the wind in different strata of the atmosphere. The result of such an irregularity would be that the spreading sound waves instead of remaining spherical would be distorted very considerably. For example, the waves would be tipped back if the wind were greater at the higher altitude and against the sound. In such case the sound would rise from the water and there would be a region close to the surface over which the fog signal would be inaudible. If, on the other hand, the wind retarded the sound less above than below, or if the wind above favored the sound the wave would be tipped forward and the sound would descend upon the sea and there would be a resulting area of audibility. As the wind at different altitudes varies greatly and changes abruptly we have an entirely adequate explanation of the phenomena.

If the medium through which the sound is being propagated is not homogeneous another very interesting series of phenomena will occur. Whether the variation in homogeneity results from the variation in composition or a variation in temperature, the effect is the same. A change in either temperature or composition results in general in a change in the velocity of the sound. Whenever sound passes from one medium to another or from one region to another in which the velocity is different the direction of the sound is changed. It is said to be refracted. The law of refraction is a very simple one,— that the ratio of the sines of the angles made by the direction of propagation of the sound in the two media with a normal to the surface separating the media is equal to the ratio of the velocities in the two media. The sound is thus always bent toward the normal in passing from a medium in which the velocity is greater to a medium in which it is less. According to this principle the so-called acoustical lenses have been made. This may be done by filling a large but thin walled spherical balloon with some heavy gas. Such a lens properly placed will focus the sound of the ticking of a watch so that it can be heard at a distance considerably greater than that at which it can ordinarily be heard. When the lens is thus made with heavy gas it is a converging lens; when made with light gas it is a diverging lens. A curious but unintentional example of the latter occurred in the House of Parliament when a shaft of warm air, rising through the large ventilator in the middle of the floor, so diverted the sound that a speaker on one side could not be heard clearly by a member immediately opposite him.

Whenever a sound traveling through one medium comes to another medium in which its velocity is different a certain portion is reflected, the amount reflected depending upon the change in velocity of the sound and upon the angle at which it strikes the surface of separation. This furnishes the explanation of the so-called aerial echoes observed by Tyndall, and a partial explanation of the rolling of thunder.

When the reflecting surface is a solid wall a very large per cent of the sound is reflected, how much, depends, of course, on the nature of the wall. Under these circumstances there are produced a large number of important phenomena which are most strikingly interesting in connection with architectural acoustics. Under special but usually accidental conditions very peculiar phenomena arise as is illustrated in the case of whispering galleries. Whispering galleries are of one or the other of two general types usually illustrated, following the lead of Herschel, by the dome in Saint Paul's Cathedral, London, and by a much less familiar building, the cathedral in Girgenti. In Saint Paul's Cathedral if a person takes a position at one side of the dome and very close to the wall he can whisper with great ease and distinctness to a person at the opposite side of the dome. This is not the case of focusing sound in the ordinary sense. The sound starting from one point is carried by the curved surface along great circles on the interior of the almost spherical dome. The sounds traveling by all these paths meet again at the opposite end of the diameter. As distinguished from this the whispering gallery in the cathedral at Girgenti is produced by a single, isolated, but focused reflection. A better and more familiar illustration of this was until recently to be found in the Hall of Statues in the Capitol at Washington. It is a necessary condition for both types of whispering galleries that the wall surfaces should be smooth and free from great projections. The whispering gallery in the Capitol at Washington has recently been destroyed by replacing the formerly smooth spherical ceiling by a rather deeply coffered ceiling in plaster. The ideal whispering gallery, should one be planned, would be secured by constructing a room a considerable portion of whose wall surface would be part of an ellipsoid of revolution with foci at the points between which the whispering is to occur. Another interesting and somewhat related phenomenon is that of multiple reflections. An interesting example of this recently occurred in a private athletic court at Rhinebeck-on-the-Hudson. In this case the ceiling was a smooth dome so nearly flat that its centre of curvature was at a distance below the

floor equal to the height of the room. Here the echo was repeated very many times and the sound was reflected three times between each repetition of the echo. Such special forms of walls not infrequently occur in auditoriums, often in a subtly concealed manner, and are the occasion of much annoyance. It might be added that it would not be a safe generalization to say that all curved surfaces are bad or that all disturbing surfaces are curved.

In the absence of specially disturbing surfaces the multiple reflection of the sound results in a general reverberation, which is from some points of view advantageous and from some harmful. The reverberation results in an increased loudness particularly of sustained tone. On the other hand by the prolongation of each sound it results in more or less confusion. When the room is to be used for musical purposes, the effect of this reverberation, unless it be carried to too great an extent, is to blend the tones and to give to the performer a sense of support from the auditorium. There is apparently a nice balance which for the best musical effects must be accurately attained in order to fully satisfy expert musical taste. The reverberation in the room as well as the general loudness and even the loudness at the several points can be calculated when the dimensions of the room and the absorbing power of its various surfaces are known.

Another feature of architectural acoustics is the phenomenon of interference. Taking first the simplest possible case when a sound from a distant source strikes normally on a plane wall, the reflected waves meeting the following on-coming waves produce by their superposition a system of stationary waves parallel to the reflecting surface. The result would be great nodal and antinodal surfaces parallel to the reflecting wall. An observer moving about in such a medium would hear the sound as very loud at the nodal surfaces. When the sound is produced in a confined space, such as a room, it is reflected from wall to wall many times and in many directions before it is ultimately absorbed. The result is an exceedingly complicated system of stationary waves. Under certain conditions the sound may be so intense at certain points of the room as to be unendurable, while at other points but a few feet distant it is so faint as to be scarcely audible. The distribution of such a system of stationary waves depends on the shape of the room, the material of the walls and the position of the source of sound. It also depends on the pitch of the sounds.

When the conditions of the room are such that a system of stationary waves are so formed that a region of great intensity coincides with the source, the phenomenon of resonance occurs. That is to say the emission of that particular note will be increased in comparison with other notes of such pitch that their greatest nodal intensity in their own interference systems does not coincide with the source. This phenomenon is called resonance. Both interference and resonance result in the destruction of chordal balance.

Audition.— The ear is ordinarily divided, in anatomical work, into three parts, the outer, the middle and the inner ear. The drum of the ear separates the outer from the middle ear, the middle ear being an air cavity connected by the eustachian tube with the nasal cavity. The sound is conducted across the middle ear by a system of three bones which connect the drum with another membrane separating the middle ear from the inner ear. The inner ear is a somewhat complicated cavity in the solid bone of the skull. It consists essentially of three semi-circular canals, and a much longer and larger snailshell-like cavity called the cochlea. This inner ear is separated from the middle ear not merely by the membrane already referred to pressed against and vibrated by the bones, but also by another small membrane. Starting from between these two membranes a diaphragm runs the length of the cochlea. This diaphragm, somewhat intricate in its complete structure, has as an essential part a system of numerous stretched fibres, varying in length and probably also in tension. When the sound is conducted from the outer ear to the inner ear by the three bones in the middle ear, the vibration is communicated to a liquid which fills the inner ear. This liquid in vibrating causes the small fibres of the diaphragm, called the fibres of Corti, to vibrate. As the fibres of Corti are of different lengths and of a different tension, different regions of the diaphragm respond to different notes. On this diaphragm terminate the auditory nerves which are stimulated by the vibration of the fibres, and communicate the corresponding sensation to the brain. The variation in pitch sensation is due to variation in the stimulated region of the diaphragm. When the sound is not a pure tone the various partial tones excite the corresponding parts of the diaphragm. When two notes are sounded, each with its system of overtones, there are regions of the diaphragm more or less excited simultaneously by the two systems. When the two partials which excite overlapping regions of the diaphragm are not of exactly the same pitch beats occur between them. These beats when slow are not wholly disagreeable, and having a tremulo effect in moderate use are not without musical value. When, however, the beats are more rapid, and this occurs when the overlapping partial tones differ more in pitch, the beats lose their distinct character as such and produce the effect known as discord. If the two partial tones differ still more in pitch the regions which they excite overlap less and less and the discord diminishes. Following out this line of argument Helmholtz was able to show that when the fundamentals having harmonic upper partials bear to each other simple ratios in their vibration frequency their discord is a minimum, deriving in this way a complete explanation of the musical scale as used in harmonic composition. The scale thus obtained is the true or natural scale. The intervals between the successive notes are not equal, but fall into two groups of so-called whole and half tone intervals. The whole tone intervals are not equal among themselves and are not twice the half tone intervals. Therefore, even after inserting sharps and flats to subdivide the whole tone intervals the resulting chromatic scale is not one of equal interval. While this is the scale which would be employed by instruments without fixed key-boards, and by the human voice accurately trained, it cannot be employed in instruments with fixed key-boards if such instruments are to be used in different keys.

For this purpose Bach invented a scale called the equally tempered scale in which all the half tone intervals are made equal. On this scale no key is accurate, but no key is so inaccurate as to result in serious discord. The following table gives the vibration frequency of the eight notes of the middle octave on the natural and on the tempered scale:

	Natural Scale	Tempered Scale
C	258.7	258.7
D	291.0	290.3
E	323.4	325.9
F	344.9	345.3
G	388.0	387.6
A	431.1	435.0
B	485.0	488.2
C	517.3	517.3

As the invention of the musical scale long preceded its use in harmonic composition, and during the period preceding the 11th century was used only in melodic composition — that is for notes sounded in sequence — the simultaneity necessary for harmonic effect was obtained by the prolongation of one note into the other. Consult Franklin, F. and Macnutt, B., 'Light and Sound' (1909); Hamilton, 'Sound and Its Relation to Music' (Boston 1911); Sabine, 'Architectural Acoustics' (Boston 1906); Saeltzer, 'Treatise on Acoustics in Connection with Ventilation' (New York 1908).

WALLACE CLEMENT SABINE,
Professor of Physics, Harvard University.

ACQUAVIVA, Andrea Matteo, än'drā-a măt'ā-ō äk'wa-vē'va, Duke of Atri and Prince of Teramo, in the kingdom of Naples: b. 1456; d. 1528. He seems to have been the first who conceived the idea of an 'Encyclopædia,' or 'Universal Dictionary of Arts and Sciences.' He published a useful work under that title in two folio volumes.

ACQUI, äk'wē, northern Italy. (1) A district in the province of Alessandria, on the north side of the Ligurian Apennines. Area, 445 square miles. Productions, corn and fruit. Chestnut-trees furnish the peasantry with an article of common food, and silkworms are reared. (2) Its capital and episcopal city, on the Bormida, 18 miles south southwest of Alessandria, 37 miles northwest of Genoa. It has commodious hot sulphur baths, and is celebrated for its great antiquity and for the remains of a Roman aqueduct. The hot sulphur baths were known to the Romans, who called the place *Aquæ Statiellæ.* There is an extensive trade in wine, silk lace and rope. Acqui has a cathedral, a royal college, and is a bishop's see. It was taken by the Spaniards in 1745; retaken by the Piedmontese; and afterward dismantled by the French. Pop. about 16,000.

ACQUISI'TION is the act by which a person procures property in a thing; also the thing the property in which is secured. Original acquisition is that by which a man secures a property in a thing which is not at the time he acquires it, and in its then existing condition, the property of any other individual. It may result from occupancy, accession or intellectual labor.

ACQUITTAL, in law, the judicial setting free or releasing a person from a contract, debt or other obligation; but the term is more commonly used in criminal law to signify the deliverance from a charge of an offense, either by a verdict of not guilty by a jury, or by simple operation of law, as in the case of an accessory where the principal is acquitted. In the United States acquittal may be the result of some technical defect in the proceedings or by the verdict in favor of the accused on the merits of the case. In the first case a second trial of the case may be instituted, but the second case is a bar to any further prosecution of the accused for the same offense. This is guaranteed by a constitutional provision that "no person shall be twice put in jeopardy for the same offense."

ACRÆI'NÆ, a sub-family of butterflies of the family *Nymphalidæ,* deriving its name from the leading genus *Acræa.* There are about 85 species, mostly African. They are of small or moderate size, and have semi-transparent wings, reddish-brown marked with black.

ACRA'NIA, a primary division of *Vertebrata,* represented by *Amphioxus* (q.v.) in which, as the name indicates, there is no skull, while the notochord extends to the anterior end of the snout, in advance of the central nervous system. There is no true brain, the region corresponding to the brain of the genuine vertebrates being very imperfectly differentiated. There are only two pairs of cerebral nerves, and the dorsal and ventral spinal nerves do not unite. There is also no trace of limbs. The pharynx is of comparatively immense size, perforated by very numerous gill-slits, and surrounded by an atrium. The liver is a hollow pouch of the intestine. There is no heart, and the blood is colorless. The numerous nephridia remain distinct and open in to the atrium. There are no paired eyes, only a single median pigment-spot in the wall of the brain; there are no ears, though an olfactory pit is present. The reproduction glands are segmentally arranged, but have no ducts.

ACRA'SIA (Gr. *ἀκρασία,* intemperance), a beautiful woman, the personification of all that is intemperate and immoderate, portrayed in Spenser's 'Færie Queene.' She lives in a "Bower of Bliss," on a floating island, in which there is everything to delight the senses. Her character was suggested by Circe, but probably more directly by the Alcina of Ariosto.

ACRE, ā'kĕr, Syria (Biblical *Accho,* Greek *Ptolemais,* other forms *Acco, Akka, Acon, Accaron;* modern French St. Jean d'Acre), a port some miles north of Mt. Carmel, on the Bay of Acre, opposite Haifa on the opposite horn. The harbor is one of the best on the coast; even so, it is much choked with sand. Its interest is chiefly in its varied and picturesque past; as the chief landing place for invasion of Syria, it has perhaps suffered more from political revolutions and war ravages than any other place in history. Its name first occurs in a letter of King Burnaburiash of Babylon to Amenhotep IV of Egypt, c. 1400 B.C. Sennacherib of Assyria captured it 701 B.C., and his son Esarhaddon about 675 gave it to the King of Tyre. After the break-up of Alexander's empire, Ptolemy Soter of Egypt took possession of it and renamed it Ptolemais; it afterward became part of the Seleucid empire of Syria; and later the Romans acquired it and made a colony of it. Under the early empire it was a city of great importance, and remnants of its grandeur in the shape of fine granite and marble

pillars still exist. In 635 A.D. the Saracens under Khaled and Obeida captured it and Damascus. They were expelled from it in 1110 by the Crusaders, who made it their principal port and retained it till 1187, when it was recovered by Saladin. Four years later it was retaken by Richard Cœur de Lion and Philip II of France, at the cost of 100,000 lives. They made it a bishopric and gave it to the order of St. John (Fr. St. Jean, from which it took its French title). These held it for just a century, despite continual assaults from the Saracens; and it was a large, rich and powerful city, filled with churches, convents and hospitals. In 1291, when it had become the last Christian stronghold left in Syria, the Saracens retook it after a bloody siege which injured it greatly. From that time it sank rapidly. In 1517 it fell into the hands of the Turks under Selim I; and at the beginning of the 18th century it was a vast scene of ruin, relieved only by a few cottages, a mosque and the houses of French factors. Toward the end of that century the Turks, especially Djezzar, much strengthened and improved it, and it rose to some importance again. It is best known in modern times for its brave and successful defense in 1799, by means of a body of English soldiers and marines under command of Sir Sydney Smith, against Napoleon, who, after spending 61 days before it, was obliged to retreat. It continued to prosper and be the seat of a considerable trade till 1832, with consuls from all the great states, though crippled by the imposts, monopolies and misgovernment with which the Turks blight every place that endures them. On the revolt of Mehemet Ali, the great Viceroy of Egypt, his son Ibrahim besieged it for five months and 21 days in the winter of 1831–32, and before he captured it its public and private buildings were mostly destroyed. The Egyptians repaired and improved its fortifications; but on 3 Nov. 1840 a three-hours bombardment by a combined English, Austrian and Turkish fleet reduced it to a ruin. The Turks were again put in possession of it in 1841.

ACRE, ā'kĕr, originally "field," "pasture," "hunting-ground"; but later a rough measure of size, somewhat similar in different countries, and supposed to represent what one man could plow in a day. The Italian term *giornate* (day's work) is significant on this point. In England reckoned as the amount a yoke of oxen could plow in a day, till the laws of the 13th century and later settled a definite measure. There and in the United States this is termed the *statute acre*, old customary acres being still used in Scotland, Ireland and Wales, as well as in several English counties, all different and some of them less than half the statute, while others are more than double. The statute acre is 43,560 square feet, or 4,840 square yards, or 160 square rods or perches (from the yard and the rod or pole with which it was measured); also divided into 4 roods, though this and perch are mere book-words in the United States at least, as is the square "chain" of 22 yards or 484 square yards, from the surveyor's chain used in measuring it. As commonly measured in feet in the Eastern States the acre is a square measuring 208 feet 8½ inches on the side. The following table gives various measures in relation to the English and American acre as the unit. The German empire having adopted the French metrical system, the German *morgen* are becoming of historical significance merely.

English	acre	1.00
Cheshire	"	2.11
Westmoreland	"	1.40
Lincolnshire	"	1.25
Cornwall	"	1.19
Leicestershire	"	0.48
Scotch	"	1.27
Irish	"	1.62
Welsh	erw	0.89
	stang	0.67
Austria	joch	1.42
Baden	morgen	0.89
Belgium	hectare (Fr.)	2.47
Denmark	toende	5.50
France	hectare (100 ares)	2.47
	arpent (common)	0.99
Hamburg	morgen	2.38
Hanover	"	0.64
Holland	"	2.10
Naples	moggia	0.83
Poland	morgen	0.83
Portugal	geira	1.43
Prussia	little morgen	0.63
	great morgen	1.40
Russia	deciatina	2.70
Sardinia	giornate	0.93
Saxony	morgen	1.36
Spain	fanegada	1.06
Sweden	tunneland	1.13
Switzerland	faux	1.62
Geneva	arpent	1.27
Tuscany	saccata	1.22
United States	acre	1.00
Wurtemburg	morgen	2.40
Roman, ancient	jugerum	0.66
Greek, ancient	plethron	0.23

NUMBER OF PLANTS FOR AN ACRE OF GROUND

Dist. apart Inches	Number of plants
3 by 3	696,960
4 by 4	392,040
6 by 6	174,240
9 by 9	77,440
Feet	
1 by 1	43,560
1½ by 1½	19,360
2 by 1	21,780
2 by 2	10,890
2½ by 2½	6,960
3 by 1	14,520
3 by 2	7,260
3 by 3	4,840
3½ by 3½	3,555
4 by 1	10,890
4 by 2	5,445
4 by 3	3,630
4 by 4	2,722
4½ by 4½	2,151
5 by 1	8,712
5 by 2	4,356
5 by 3	2,904
5 by 4	2,178
5 by 5	1,742
5½ by 5½	1,417
6 by 6	1,210
6½ by 6½	1,031
7 by 7	881
8 by 8	680
9 by 9	537
10 by 10	435
11 by 11	360
12 by 12	302
13 by 13	257
14 by 14	222
15 by 15	193
16 by 16	170
16½ by 16½	160
17 by 17	150
18 by 18	134
19 by 19	120
20 by 20	108
25 by 25	69
30 by 30	48
33 by 33	40
40 by 40	27
50 by 50	17
60 by 60	12
66 by 66	10

ACRÉ RIVER, ä'krā, South America (also called **ACQUIRY**, ä'kē-rē), a tributary of the Purus River. Its sources are on the eastern

Andean slopes near lat. 11° S. From the point at which it becomes navigable for small steamers its course is generally northeast to its confluence with the Purus; the latter flows nearly parallel to and north of the Madeira, emptying into the Amazon west of Manáos. Together these rivers give access to an exceedingly valuable rubber forest district, long in dispute between Bolivia, Peru and Brazil.

ACRÉ TERRITORY. See BRAZIL.

ACRES, a'kĕrz, **Bob,** an awkward young country booby of the gentleman class of England, who figures in Sheridan's comedy of 'The Rivals.'

ACRIDINE DYESTUFFS. See COAL TAR COLORS.

ACRISIUS, a-krish'ĭ-ŭs, in Greek mythology, King of Argos. He expelled his twin brother Prœtus (q.v.) from his inheritance and for a time ruled alone in Tiryns and Argos, but was later forced to surrender to his brother the former kingdom. He was the reputed founder of the Delphic amphictyomy. For the legend concerning the prediction of the oracle that he would die at the hands of his grandson, see PERSEUS.

AC'ROBAT. See GYMNASTICS.

ACROCERAUNIUM, ak'rō-se-râ'nē-um, the northwestern promontory of Epirus, with mountains called Acroceraunia ("thunder-peaks"), which separated the Ionian and Adriatic Seas, and were noted for attracting storms, and hence dreaded by mariners. Its modern name is Chimara or Cape Glossa, or Cape Linguetta.

AC'ROCORIN'THUS, in ancient times the acropolis or citadel of Corinth: a steep rock nearly 1,900 feet high, overhanging the city, and crowned with the remains of Venetian and Turkish fortifications, ruins of mosques and dwelling-houses, and also a barrack with a few soldiers. On its top stood of old a temple of Aphroditē.

ACROLEIN, a colorless liquid which has a very irritating odor. Its chemical formula is C_2H_3CHO. Acrolein is produced in the incomplete combustion of fats and when glycerin is distilled with sulphuric acid. When the wick of a candle is left smoldering after the flame has been blown out some acrolein is produced. It is classed with the aldehydes.

AC'ROLITHS (Gr. signifying "extremities of stone"), statues of which head, hands and feet were of marble, attached to a trunk of wood, covered with drapery, or gilt. The Athene Areia of the Platæans mentioned by Pausanias is one of the best known acroliths.

AC'ROMEG'ALY (Gr., signifying "extremes enlarged"), a disease first described by Marie in 1886, as a permanent enlargement or overgrowth of the extremities — head, hands and feet,— caused by certain types of tumor, chiefly adenomate, of the hypophysis or pituitary gland. Both sexes, but a larger percentage of the female, are subject to the disease which has a gradual beginning, usually in the thirties. Giants are mostly cases of acromegaly which are arrested early and which have sprung from disorder of the pituitary before adolescence. Consult Osler, 'Modern Medicine' (Vol. VI, New York 1910); Jelliffe and White, 'Diseases of the Nervous System' (1917); Cushing, 'The Pituitary Body' (1913).

ACROP'OLIS, the high part of any ancient Greek city; usually an eminence overlooking the city and frequently its citadel. Notable among such citadels were the Acropoleis of Argos, of Messene, of Thebes and of Corinth; but pre-eminently the Acropolis of Athens, to which the name is now chiefly applied. This was the original city (as indeed most of the acropolises date from the times of barbaric insecurity), later the upper city as distinguished from the lower, and was built upon a separate spur or butte of Hymettus. The hill rises out of the plain, a mass of rock about 260 feet high, with precipitous sides save for a narrow access at the western end where there was a zigzag road for chariots. The summit of this rock forms an uneven plain 500 by 1,150 feet at the maximum breadth and length. Within this area were reared, chiefly in the days of Pericles, remarkable specimens of architectural art. The buildings were grouped around two principal temples, the Parthenon and the Erechtheum. Between these temples stood the statue of Athene Promachos ("fighter in front"), by Phidias, the helmet and spear of which were the first objects visible from the sea. About these centre-pieces, covering the rocky height and extending down the steep sides, were lesser temples, statues, theatres, fanes and odea (music halls). Among the famous buildings on the sides of the Acropolis were the Dionysiac theatre, the Odeum of Pericles and the Odeum, built by Herodes Atticus in honor of his wife Regilla. The ravages of accident and war and Athenian marble-merchants, and in case of the Parthenon (q.v.) its deliberate dismantling by Lord Elgin early in the 19th century, have largely destroyed and despoiled these classic works. Archæologists have secured many important remains of the Acropolis, which are preserved in the collections of various European capitals and in the new archæological museum at Athens.

AC'ROPOL'ITA, Georgius, Byzantine historian and statesman: b. Constantinople 1217; d. 1282. Appointed "great logothete" or chancellor in 1244, he was instrumental in effecting a reconciliation between the Latin and Greek churches in 1274. His 'Annales,' covering the period from the capture of Constantinople by the Latins in 1204, to its recovery in 1261 by Michael Paleologus, is a valuable contemporary work which, with his other writings, was published in a complete edition in 1903. Consult Heisenberg, A., 'Teubner Series' (Vol. II, which contains a full life, with bibliography Leipzig 1903).

ACROS'TIC, a poetical composition, disposed in such a manner that the initial letters of each line, taken in order, form a person's name or other complete word or words. This kind of poetical trifling was very popular with the French poets from the time of Francis I until Louis XIV. Among other English writers, Sir John Davies, who lived in the 16th century, amused himself in this way. He produced 26 pieces called 'Hymns to Astrea,' each of them

forming an acrostic upon the words Elisabetha Regina. The following is an example:

E ternal virgin, goddess true,
L et me presume to sing to you.
I ove, e'en great Jove, hath leisure
S ometimes to hear the vulgar crew,
A nd heed them oft with pleasure.

B lessed Astrea! I in part
E njoy the blessings you impart,
T he peace, the milk and honey,
H umanity and civil art,
A richer dow'r than money.

R ight glad am I that now I live,
E 'en in these days whereto you give
G reat happiness and glory;
I f after you I should be born,
N o doubt I should my birthday scorn,
A dmiring your sweet story.

In the Old Testament there are 12 psalms written according to this principle. Of these the 119th Psalm is the most remarkable; it consists of 22 stanzas, each of which commences with a Hebrew letter and is called by its name. Acrostic verse is no longer cultivated by serious poets, and has in fact been relegated mainly to country newspapers, except as a jest or social pastime. Edgar Allen Poe, however, wrote some striking acrostics, varying the form with great ingenuity. One example, beginning with the first letter of the first line, the second of the second, and so on, forms a lady's name.

AC'ROTE'RION ("extremity"), in architecture, an ornament — statue, palmette, or leaf-decoration — placed on the apex of a pediment or one of its lower angles.

ACT. *In the drama,* one of the parts into which a play is divided, to mark change of time or place, to give a respite to the actors and audience from the strain and physical fatigue of sitting intent on a long play, and to enable actors to change costumes and managers to change scenery. In Greek plays, where there was no scenery and no change of costume, there were no separate acts,— the episodes separated by the lyrical portions being not such either in design or effect,— and the action was continuous from beginning to end and the unities strictly observed. If the principal actors left the stage, the chorus took up the argument and contributed an integral part of the play; chiefly in the form of comment on the action, but often by supplying necessary information impossible to give in the regular speeches. When it was desired to develop the story further than the single play could conveniently do, another *drama,*— etymologically the same as *act,*— carried it on to another time or place, forming the common Greek trilogies, or groups of three, in which the same characters reappear. The Roman theatre first adopted the division into acts, suspending all stage business in the intervals. They made the regular number five, and Horace sets this down as a fixed rule of art. On the revival of letters it was almost universally used by dramatists; and that it rests on something more than caprice is shown by the fact that Shakespeare, who cared nothing for fixed rules of art and utterly disregarded the unities, never varies this division. For a great drama there is a real reason, though in light comedy it is admost universally dropped at present. The natural division is into three,— introduction, climax and conclusion; and the central act still fulfils the same function. But for a great action this is apt to hurry matters too fast for a proper development either of character or interest; hence the first and the last act are doubled, the approach to the main point and the preparation for the catastrophe being both rendered more gradual. Some critics have laid down exact rules as to the part each act is to sustain in a play; but these cannot be justified and have never been regarded. It is obvious, however, that each act should form a certain unity, ending with a point of deep but suspended interest, yet should be an integral part of the whole. Molière began the three-act comedy; but even to an impatient generation this is too short for a play of power, and four is most preferred. See DRAMA.

In law.—(1) Anything officially done by the court, as the phrases "Acts of Court," "Acts of Sederunt," etc. (2) In bankruptcy, an act the commission of which by a debtor renders him liable to be adjudged a bankrupt. (3) In civil law, a writing which states in a legal form that a thing has been said, done or agreed. (4) In evidence, the act of one conspirator performed in pursuance of the common design may be given in evidence against his co-conspirators. (5) Acts done, distinguished into acts of God (q. v.), of the law and of men.

In mental philosophy, an operation of the mind supposed to require the putting forth of energy, as distinguished from a state of mind in which the faculties remain passive. In this sense such expressions as the following are used: The act of thinking, the act of judging, the act of resolving, the act of reasoning or of reason; each of these being viewed as a single operation of the human mind.

In parliamentary language, an ellipsis for a law enacted by a congress, legislature, parliament, etc. A statute, law or edict, consisting of a bill which has been successfully carried through both Houses of Congress or legislature, and received the approval of the executive. See specific title *infra,* ACT OF GOD; ACT OF SETTLEMENT; ACT OF SUPREMACY; ACT OF TOLERATION; ACT OF UNIFORMITY; ACTS OF CONGRESS; ACTS OF PARLIAMENT; ACTS OF TRADE; BILLS, COURSE OF; BILLS, PRIVATE.

In theology, the carrying out of an operation in a moment, as contradistinguished from the performance of a work requiring a considerable time for its accomplishment.

In universities, of old, the commencement or taking of degrees; now disused save as a form at Cambridge, England. The student "keeps the act" by reading a Latin thesis which he must defend against three opponents named by the proctors.

ACT OF GOD, an accident which arises from a cause which operates without interference or aid from man. The term is sometimes used as equivalent to inevitable accident, but incorrectly according to some authorities, although Sir William Jones proposed the use of "inevitable accident" instead of "act of God."

ACT OF INDEMNITY, or **ACT OF OBLIVION,** an English statute of 1660, entitled "An Act of Free and Generall Pardon, Indempnity and Oblivion," by which all political offences committed during the time of the Commonwealth were pardoned, certain offenders mentioned by name in the act being excepted, particularly those engaged in the trial and execution of Charles I.

ACT OF SETTLEMENT, an act of the Parliament of England in 1701, vesting the hereditary right to the English throne in Sophia, Electress of Hanover, and her Protestant descendants, constituting the source of the sovereignty of the House of Hanover or Brunswick, the present ruling line. The act prohibited the king (or queen) from going to war in defense of non-English powers without the assent of Parliament.

ACT OF SUPREMACY. (1) An act of the Parliament of England, in 1534, by which the king was made the sole and supreme head of the Church of England. (2) A re-enactment of the above, with changes, in 1559.

ACT OF TOLERATION, usually known as the *Toleration Act,* an act of the reign of William and Mary, granting freedom of religious worship, under certain comparatively moderate conditions, to all dissenters from the established Church of England except Roman Catholics and persons denying the Trinity. This act, as confirmed in the reign of Anne, was the basis of various subsequent measures of religious toleration, culminating in the Catholic Relief Act of George IV, and the still more liberal legislation of Victoria.

ACT OF UNIFORMITY. (1) An act of the Parliament of England (1559) adopting a revised liturgy for the Church of England, entitled "An Act for the Uniformity of Common Prayer and Service in the Church, and Administration of the Sacraments." (2) An act of Parliament (1662) requiring that the revised Book of Common Prayer and Ordination of Ministers, and no other, should be used in all places of public worship and be assented to by clergymen. By this test more than 2,000 non-conforming clergymen were ejected from their churches. It took effect on St. Bartholomew's Day (24 Aug. 1662), and accordingly is known in English history as the "Bartholomew Act," the day of its enforcement being known as "Black Bartholomew."

ACT'A DI'URNA ("Daily Acts"); also called ACTA POPULI, "Acts of the People"; PUBLICA, "Public Acts"; URBANA, "Municipal Acts." Written daily newspapers in ancient Rome, posted up in public to be read or copied, then taken down and filed in the public archives. The news was collected by reporters (*actuarii*) employed by the state, and consisted of much the same sort of matter as that contained in modern newspapers; a miscellany of everything that might interest the citizen, from the latest war news, abstracts of the best speeches in the Senate or Forum or the courts, the most important legal decisions or political events, probably even to interviews, down to the most trivial gossip of the town,— not only births, marriages, divorces and deaths, murders, domestic infelicities and accidents, but any unusual omens or prodigies, *lusus naturæ,* etc. Petronius in 'Trimalchio's Feast' gives an admirable burlesque of it. The letters of Romans to out-of-town friends were regularly furnished with spicy news from the *Acta Diurna,* which seem to have taken the place of the older 'Annales' or yearly chronicles, too slow for the active later republic and only reporting the more important occurrences, some time after 131 B.C. The usual statement is that Julius Cæsar introduced them; but it hardly seems probable that the Roman people, once used to even an imperfect form of news-gathering, dispensed with it altogether for three-quarters of a century and did not think of it again until it was invented for them. It is certain, however, that it was in use in Cæsar's time, for he ordered Antony's offer of a crown to him on the Lupercalia to be set down in the *Acta Diurna.* Consult Le Clerc, 'Roman Newspapers' (in French, 1838, entertaining but not cautious in facts); Hübner, 'Acta of the Roman Republic' (in Latin, Leipzig 1860).

ACTÆ'A, a genus of American plants of the family *Ranunculaceæ. A. alba* or white cohosh, or baneberry, is found in rocky woods from Georgia northward. *A. rubra,* red cohosh, or red baneberry, is widely distributed in eastern North America.

AC'TA E'RUDITO'RUM, the first literary journal of Germany. It was started in 1682 by Prof. Otto Mencke of Leipzig, and enjoyed a long existence and great popularity. It was owned by his family till 1754, after which it began to decline in value and in the number of its subscribers; and the irregularity of its appearance became at length so great that the last volume, for 1776, was published in 1782, exactly a century from the time when the journal was commenced. The whole consists of 117 quarto volumes, including the supplementary volumes and indices. In this journal Leibnitz first gave to the world his notions respecting the differential calculus.

ACTÆ'ON, ak-tē'on, in Greek mythology, the son of Aristæus and Autonoë (a daughter of Cadmus), a great hunter. He was turned into a stag by Artemis (Diana) for looking at her when she was bathing (or, as some say, for boasting that he was superior to her in hunting), and was torn to pieces by his own dogs. This incident is exhibited in various ancient works of art.

AC'TA SANCTO'RUM, or **MAR'TYRUM,** the collective title given to several old writings respecting saints and martyrs in the Greek and Roman Catholic Churches, but now applied especially to one extensive collection begun by the Jesuit Rosweyd, and continued by J. Bolland. The work was carried on (1661) by a society of learned Jesuits, who were styled Bollandists, until 1794, when its further progress was prevented through the invasion of Holland by the French. In recent times the undertaking has been resumed.

ACTIN'IA. See SEA-ANEMONE.

ACTINIA'RIA (Gr. *aktis,* ray), the sea-anemones. See ANTHOZOA; SEA-ANEMONE.

ACTIN'IUM. A radio-active substance discovered by Debierne in 1900, while working up uranium residues in the Curie laboratory. It has the chemical properties of an element between calcium and lanthanum. All efforts to isolate it from the rare earths, with which it is found in mixture, have failed, and its place of origin in the uranium series has not been discovered. Actinium gives off the same kinds of rays as radium but the emanation diminishes to half its initial vigor in a few seconds. Like radium and polonium, actinium is prepared from pitchblende and belongs to the iron group. Actinium preparations which are some months old emit α, β and γ rays.

The last, however, have a lower penetrating quality than those of radium or thorium. By fractional crystallization of the double nitrate of the rare earths and magnesium nitrate preparations of actinium have been obtained which show 100,000 times the radio-activity of uranium. The spontaneous decomposition of actinium affords a series of six successive products. Actinium preparations are highly radio-active and induce radio-activity in surrounding objects. As with other radio-active substances the ultimate product of actinium is helium. Actinium salts evolve an inert gas having the molecular weight of (about) 70. (See RADIOACTIVITY). Consult Rutherford, E., 'Radio-Active Substances and Their Radiations' (Cambridge, Eng. 1913).

ACTIN'OGRAPH, a name sometimes given to the actinometer (q.v.), especially when it is arranged so as to give an automatic record of the intensity of the light. The simplest form of this instrument is one in which standard photographic plates or films are exposed to the sun's action for short, definite periods.

ACTINOM'ETER, an instrument for measuring the intensity of the chemical action of the sun's rays. For use in photography for the judging of times of exposure, the essential part of the instrument is a strip of sensitive silver paper which is blackened by the sun's rays, the time required to darken the paper to a definite shade being taken as the index to the intensity of the light. Any other chemical action that light rays are capable of performing may be made the basis of an actinometer; but the indications of instruments in which the fundamental chemical changes are different will not necessarily agree with one another, because any given actinometer shows nothing but the intensity of the particular part of the spectrum which performs the chemical change upon which that instrument is based. Sir John Herschel's actinometer was a thermometer whose bulb contained a blue solution of sulphate of copper and ammonia. The expansion of this solution, by absorbing the sun's rays, measured the quantity of chemical rays in the sunshine. Bunsen, Draper and Roscoe selected instruments sensitive to certain selected radiations, such as cause chemical or other changes. In this case the sun's rays perform molecular work and are measured by the effects. For example, when a chlorine and hydrogen mixture is converted into hydrochloric acid, the quantity of acid produced in a given period is a measure of the intensity of the rays which produced it. Ferric-oxalate and chloride of iron dissolved in water and exposed to the sun's rays give out carbonic acid gas and the quantity of the latter given off may be used as a basis of measuring the intensity of the rays. A photographic plate exposed for a short period of time receives an impression the intensity of which is determined by a scale of tints or shades, and this intensity of the impression in a given period is made the basis for determining the intensity of the sunshine. When the sensitive element, used as a measuring medium, absorbs all the radiation of all wave-lengths the instrument is more properly called a pyrheliometer (q.v.).

ACTINOMETRY, in general, the measurement of either the relative or absolute effect of solar or other radiation. In particular, it refers to the measurements of only actinic effects, i. e., chemical, photographic and similar reactions.

ACTINOMYCO'SIS, a disease due to a vegetable parasite known as the ray fungus, *Actinomyces bovis,* of the fungus class. This fungus lives its life in grasses and plants and thus infects cattle, in which animals it is comparatively frequent, causing the disease known as "big jaw," or "lumpy jaw." These in turn affect man. It is also found in horses, pigs, sheep, deer and llama. The disease has been recognized since 1825 and is often mistaken for cancerous, tuberculosis or syphilitic tumors. Böllinger first accurately described the disease in cattle in 1877. It is found throughout Europe and the Americas. The fungus is found in all tumors and abscesses of the disease and is readily detected by the microscope. Cattle are usually affected in the salivary glands, the inferior maxillary bones, the tongue, œsophagus and pharynx. Hogs are generally affected in the udder. Great difference of opinion exists regarding the position of the fungus, but it is generally held that part of its life is spent on a plant host. Grasses with sharp awns appear to be a chief agency for the transfer of the ray fungus to cattle. The general treatment consists in opening, draining and sterilizing the abscesses, wherever accessible, and by administering internally potassium iodide. The disease pursues a slow, chronic course. Infection in man and cattle most frequently takes place through diseased teeth or abrasions of the mucuous membrane of the mouth. See PARASITES.

In man the symptoms are often very obscure. Some infections of the lungs have appeared to be cases of pulmonary tuberculosis. Pathologically the disease is one of new connective tissue formation with abscess production. It is a chronic disease, and often is a slow, suppurative affair affecting the tissues about the pharynx and neck. The bones, lungs and intestinal tract may be affected. The diagnosis may be readily made by the microscope. Consult Salmon, D. E., 'Investigation Relating to the Treatment of Lumpy-Jaw, or Actinomycosis in Cattle,' Department of Agriculture Bulletin No. 2 (1893); Salmon, D. E., et al., 'Special Report on Diseases of Cattle and Cattle-Feeding,' Report of United States Department of Agriculture for 1904, Bureau of Animal Industry (Washington 1904). For the disease in man consult Osler, 'Modern Medicine' (New York and Philadelphia 1910).

ACTIN'OPHONE, better known as the radiophone (q.v.).

ACTINOZO'A, or AN'THOZOA, a class of cœlenterates which exist only in the polyp state, not giving rise to a medusa form. They are represented by the sea-anemone (q.v.) and coral polyps. Their bodies are vase-shaped, usually fixed at one end, though most of them are capable of slowly moving about. They are provided with a digestive sac partially free from the body-cavity opening into it below and held in place by six or eight mesenteries radiating from the digestive cavity and dividing the perivisceral space into chambers. The mouth is surrounded with a circle of tentacles which are hollow, communicating directly

with the perivisceral chambers. There is a slightly marked bi-lateral symmetric. To the edges of the mesenteries (usually the free ones) are attached the reproductive glands, both male and female, or of one sex alone; also the "craspeda," or mesenterial filaments, which contain a large number of threadcells (q.v.). The body is either entirely fleshy or secretes a calcareous or horny coral-stock, and when the species is social it is connected by a cœnenchyme. In some forms, as sea-pens (q.v.) the entire colony is capable of limited locomotion. There is no well-marked nervous system, but a plexus of fusiform ganglionic cells connected by nerve-fibres in the base of actinians. Reproduction takes places by self-division, gemmation, or by eggs, the sexes being separate or united in the same individual; the young undergoing a blastula and gastrula condition and then becoming fixed.

The Actinozoa are divided into two subclasses, the *Zoantharia* and the *Alcyonaria* (qq.v.).

ACTION. *In law,* the formal demand of one's right from another person, made and insisted in a court of justice which has jurisdiction of the person and the subject-matter of litigation. In a quite common sense, action includes all the formal proceedings in a court of justice attendant upon the demand of a right made by one person, or party, of another in such court, including an adjudication upon the right, and its enforcement or denial by the court.

The parties to an action are called plaintiff and defendant, and the former is said to sue or prosecute the latter, hence the word suit instead of action. In some few instances the redress sought by a civil action consists in the recovery of some specific article of property wrongfully and unlawfully taken by the defendant from the plaintiff, but most frequently the object of an action is to obtain compensation in money for an injury complained of, which compensation is technically called damages.

The action is said to terminate properly at judgment.

Civil actions are those actions which have for their object the recovery of private rights, or of damages for their infraction.

Criminal actions are those actions prosecuted in a court of justice, in the name of the government, against one or more persons accused of a crime.

Transitory actions are those civil actions the cause of which might have arisen in one place or county as well as another.

Local actions are those civil actions the cause of which could have arisen in some particular place or county only.

Personal actions are those civil actions which are brought for the recovery of personal property, for the enforcement of some contract or to recover damages for the commission of an injury to the person or property.

Real actions are those brought for the recovery of lands, tenements and hereditaments. Mixed actions are those which partake of the nature of both real and personal actions.

In higher theoretical mechanics the word "action" is used to signify the value of a certain integral, whose form may vary according to the character of the problem in hand. In the case of a single particle the action is the space integral of the momentum of the particle, or it is double the time integral of its kinetic energy. In a system of such particles the total action is the sum of the actions of the constituent particles. It is probable that the physical principle corresponding to the mathematical expression called "action" will some day be exhibited to us in a simple form; but up to the present time no mathematician or physicist has succeeded in doing this. The importance of "action" as a mathematical conception may be seen from the following theorem, which has long been known: "If the sum of the potential and kinetic energies of a system is the same in all its configurations, then, of all the sets of paths by which the parts of the system can be guided by frictionless constraint to pass from one given configuration to another, that one for which the action is least is the natural one, and requires no restraint." The theorem just stated is known as Maupertuis' "principle of least action." There is also a principle of stationary action, and one of varying action; but it is impossible to elucidate these without a prohibitive amount of mathematics. The last two principles were formulated by Sir William Rowan Hamilton.

In theoretical mechanics the word "action," is also used to signify a force acting upon a body, as in the expression "action and reaction." See FORCE; MOTION, LAW OF.

In applied mechanics the mechanism by which some operation is effected in a machine is often called the action of the machine; thus we speak of the action of a gun, meaning the mechanism governing the loading and firing of the gun: or of the action of a piano, meaning the combination of keys, hammers and other parts, by which the player causes the strings of the instrument to vibrate.

Consult Holmes, 'The Common Law'; Pollock and Maitland, 'English Law'; and Sohm, 'Institutes of Roman Law' (2d ed., 1901).

ACTIUM, ak'shium, Greece, now Akri, a promontory on the west coast jutting out from the northwest extremity of Acarnania, on the Ionian Sea at the entrance of the Gulf of Arta (old Ambricia), opposite Prevesa and just north of Santa Maura (old Leucadia). Forts Punta and Aktium defend it. It represents one of the greatest of historical landmarks: the naval battle of 2 Sept. 31 B.C., between Octavianus (later the Emperor Augustus) and Antony, which decided the mastership of the then civilized world. For the reasons of the engagement, see ANTONIUS; it was fought by him, not for victory but for escape, which partly explains its half-heartedness and result on his side. Both armies were drawn up on the shore watching it. After waiting four days for a calm they engaged about noon on the fifth. Antony had some 500 large ships, Octavianus fewer and lighter ones. Antony on his right was opposed to Agrippa, Octavianus on his to Cælius; Cleopatra's 60 were in the rear supporting Antony's forces. Antony's vessels were huge hulks, too clumsy for manœuvring; but on the other hand so impenetrable with iron-bolted timbers and brass plates and spikes that Octavianus' galleys dared not ram them for fear of shattering themselves, and skirmished rapidly around, hurling missiles and trying to board. It was more like the besieging of forts than a naval battle; one of Antony's tall structures being often surrounded with three or four of its

nimble foes pouring darts and fire-balls into it, to which it replied from catapults loaded with heavy missiles. At length Agrippa used his superior numbers to attempt a flanking movement; Antony's flag-captain drew his wing away from the centre to prevent it; Cleopatra took alarm, and to make sure of escape her squadron broke through the front rank, throwing it into disorder, and sailed away for Egypt. Antony jumped into a small galley and followed her, leaving his command to its fate; even so it fought on till about 4 P. M., when 300 ships had been taken and many burned, and 5,000 men killed; it then yielded. The land army surrendered a week later. In commemoration of the triumph Octavianus enlarged the temple of Apollo at Actium, dedicated his trophies there, instituted quinquennial games and built Nicopolis ("city of victory") on the site of his army's camp, near the modern Prevesa. (Plutarch's 'Life of Antony' is the only first-hand account in an English translation; and Dion Cassius, in Greek, is much later and less judicious). See ANTONIUS, MARCUS; AUGUSTUS; CLEOPATRA.

ACTON, John Emerich Edward Dalberg, BARON, historian: b. Naples, 10 Jan. 1834; d. Bavaria, 19 June 1902. He was educated under Dr. (afterward Cardinal) Wiseman at Oscott College, England, and at Munich under Ignatius von Döllinger, whose friend and adherent he remained throughout life. He was returned to Parliament for Carlow (1859) and for Bridgnorth (1865), but was unseated on a scrutiny of the vote; created a peer (Baron Acton of Aldenham) in 1869 by Gladstone, whose trusted friend and adviser he was. A strong Liberal in politics and religion, he founded the 'Home and Foreign Review' (1862–64) in the interest of the liberal Catholic party, and adopted the Home Rule idea before Gladstone himself. At the Œcumenical Council in Rome (1870) he vigorously opposed the dogma of papal infallibility. From 1895 to 1902 he held the office of regius professor of modern history at Cambridge University. A scholar of wide and vast erudition, his passion for acquiring knowledge seemed to act as a check upon his productive powers. No modern man of such first-rate abilities has left so few literary productions by which posterity may judge of those abilities. Between 1868–90 he gave to the press a few historical essays and anonymous letters; and in 1895 he published a 'Lecture on the Study of History.' In 1882 he planned a comprehensive history of liberty, but never carried out the design. His university lectures were models of narrative, fullness of thought and flawless exactitude of statement. 'The Cambridge Modern History' (Vol. I, 1902) was planned and outlined by him.

ACTON, SIR John Francis Edward, English adventurer, son of an English physician and a French lady: b. Besançon, France, bapt. 3 June 1737; d. Sicily, 12 Aug. 1811 Entering the Tuscan navy under his uncle's auspices, he commanded a frigate in the Algerian expedition of 1775, performed daring exploits in covering its retreat and attracted the notice of Caramanico, favorite of Queen Caroline of Naples; and the Queen, ambitious of playing a large European part, persuaded her brother, the Grand Duke of Tuscany, to lend Acton to her to reorganize her navy. He soon became her prime favorite, commander-in-chief by both land and sea, and ultimately prime minister, shelving Caramanico on foreign missions. He improved the roads and ports, but excited great discontent by the consequent taxation and the positions given to foreigners. In 1793 he formed the league between Naples, Austria and England against France; in 1798 the French victories forced him to fly with the royal family to Sicily, and the Parthenopean Republic was formed. Five months later they were back, and he, with a "Junta of State," instituted a reign of terror, sending many to the prison or the block. In 1804 he was removed at French demand, and in 1806, when the French entered Naples, he was obliged to take refuge in Sicily again, where he died with the ill will of all parties.

ACTON, Thomas Coxon, American financier and public official: b. New York, 23 Feb. 1823; d. there, 1898. He was a leading banker, and in early years was assistant to the county clerk and deputy register; 1860–69 metropolitan police commissioner, 1862–69 president of the board. During the draft riots of July 1863 he commanded the entire police force in person for a week, rendering highly valuable service. He was superintendent of the United States Assay Office 1870–82, and assistant treasurer of the United States at New York 1882–86. He was always an active agent in administrative and social reforms in the city; carried through against bitter opposition the creation of a paid fire department; and assisted in founding the Society for the Prevention of Cruelty to Animals and the Society for the Prevention of Cruelty to Children. He declined a nomination for mayor.

ACTORS' CHURCH ALLIANCE OF AMERICA, an organization whose purpose is to establish a closer relation between the church and the theatre, founded in 1899 by Walter E. Bentley, a clergyman who had once been an actor. It uses its influence against theatrical performances on Sundays and provides chaplains of all denominations to care for the spiritual needs of all connected with the dramatic profession. It is affiliated with a similar organization in Great Britain. The total membership is about 5,000 and it has at its call about 1,500 chaplains in 400 American cities.

ACTS, Apocryphal. See APOCRYPHA.

ACTS OF THE APOSTLES. One of the books of the New Testament. The title, *Acts of the Apostles* (simply *Acts* in the old *Codex Sinaiticus*), was not bestowed by the author, and does not correspond to the contents of the work. The book seeks to describe a great historical fact, namely, the growth and expansion of the Christian Church, under the guidance of the spirit of Jesus, from its beginning in the small group of personal friends and disciples of Jesus (who were all Jews living in or near Jerusalem), until, having penetrated the Gentile world, it finally reached and gained a foothold in the capital of the empire, Rome itself. That this, and not to record the acts or deeds of the apostles, was the purpose of the work is indicated in i, 8, which forecasts the general plan and contents. The narrative begins with Jesus' last interview with His disciples before His ascension, and then exhibits the origin and development of the Christian

community or church, externally, in virtue of the gift of the Spirit at Pentecost and of the preaching and missionary activity of the spirit-filled apostles, especially Peter and John; and internally, in reference to certain details of organization and modes of conduct and worship. In its first stages the movement was confined to Jerusalem or its immediate vicinity, was limited to Jews exclusively, and in due time attracted the attention of the Jewish authorities, who tried in vain to check its progress (i, 1—vi, 7). A crisis came when Stephen, a Hellenistic Jewish convert, who had defined this as different from and superior to the existing Jewish system, suffered martyrdom, and a violent persecution of the Christians of Jerusalem followed. The resultant scattering of active Christian workers throughout Palestine only fostered the growth of the new movement, and soon Christian disciples and communities were to be found in all parts of the land (vi, 8—viii, 39).

As yet, however, the Gospel had been preached to none but Jews. But soon, under the guidance of the Spirit, the movement took on a larger scope, and to the Gentile world the blessings of the new faith were made known. The historian notes three significant facts that were influential in bringing about this great result: (1) The conversion of Saul, the ardent Jewish persecutor, destined to become the great apostle to the Gentiles (ix, 1–30); (2) The revelation to Peter in the case of the Roman centurion Cornelius of Cæsarea (ix, 31—xi, 18); (3) the spontaneous preaching of the Gospel to Gentiles at Antioch and its consequences (xi, 19–30). After noting the vain attempt of Herod Agrippa I to check the growth of the Church (Ch. xii), the interest of the narrative centres on the great Gentile-missionary propaganda, of which the chief exponent and champion was the Apostle Paul. The first section of this (xiii, 1—xv, 35) tells how Paul and Barnabas, by direction of the Holy Spirit, were the first to conduct a mission to the Gentiles on a large scale, and how the seal was set on this work by the apostolic council at Jerusalem. The remainder of the work is devoted to Paul's subsequent missionary activity, first in the East (Asia Minor, Macedonia, Achaia) and then, after his arrest and imprisonment, in Rome itself, though as a prisoner (xv, 36—xxviii). The book ends somewhat abruptly.

As 'Acts' is the only early account in existence of the apostolic period, and is also our one and only source for the historical background of Paul's Epistles, and thus enables us to construct an intelligible outline of the great apostle's career, its value is inestimable.

Because of its great importance 'Acts' has been subjected to a criticism more severe than has been meted out to any other New Testament book with the possible exception of the fourth Gospel.

The traditional view that 'Acts' was written by Luke the physician, one of Paul's companions and fellow-workers, the author of the third Gospel, may be said still to hold its place. No other view has succeeded in gaining any general acceptance. The uniformity of style and vocabulary shows quite conclusively that the book is the work of one hand, and until a more plausible view is set forth the early church's tradition that it was Luke's hand is to be accepted as true.

The problem of the *sources* used by the author of 'Acts' is of special interest. The narrative, as far as xv, 35, as has been shown above, relates facts that transpired or were well known in the Aramaic-speaking circles of the early Jewish-Christian church. This is especially true of Chs. i–xii. The remainder of the narrative is mainly concerned with Paul's mission to the Gentiles. Recent investigations (such as those by Dr. C. C. Torrey, noted below) have only made quite probable what had been suggested earlier, namely, that for the material given in i, 1—xv, 35, Luke depended in the main on written Aramaic sources, which he himself translated quite literally, adding only a comparatively small amount of his own free composition. It must be said, however, that this view needs a thorough testing and sifting before it can be accepted as final.

For the remainder of his narrative (xv, 36 to the end), Luke must have depended partly on the results of his own inquiries of those cognizant with the facts, including the Apostle Paul himself, and partly on his own memory concerning those events with which he was personally acquainted. This personal responsibility is probably indicated by the author in the use of the first person plural in the so-called "we" sections (xvi, 10–17, and xx, 5, to the end of the book), sometimes called "the travel-document."

Closely related to the problem of the sources is that of the credibility and accuracy of 'Acts.' Of the credibility of the narrative in its general outline there can be no reasonable question. But its accuracy in detail, in many instances, is open to doubt. Such errors as exist may be due in some cases to the source Luke was using; in others, to imperfect or incorrect information which he took to be reliable; in others, to simple omissions of facts which Luke may have known but chose not to mention, and in still others to a failure on Luke's part to grasp the significance of events, or to carelessness in the way he set them down. The differences, e. g., between the story of Paul's conversion, in Ch. ix, and the subsequent accounts in Chs. xxii and xxvi, may be due to the fact that in Ch. ix Luke has simply transcribed without alteration a written source, while in the later passages he set down Paul's own account as he remembered hearing it given. The discrepancies between Ch. xv and Paul's own account in Gal. ii, 1–10, of his experiences at the council, may be due to Luke's faithful transcription of an Aramaic source written from a point of view entirely different from that of Paul himself. If the "we" sections alone cover the events and period of Paul's career with which Luke was personally acquainted or connected, it is not surprising that Luke may not have been minutely acquainted with the small details of Paul's relations to the churches of Corinth and Ephesus as these are revealed in Paul's letters. But such discrepancies, which are doubtless to be found in considerable numbers between 'Acts' and some parts of Paul's Epistles, are more than offset by the numerous and often reciprocally explanatory agreements between the two. This is the more significant when we consider that there is no probability that Luke had read

these Epistles when he wrote 'Acts.' That Luke always caught Paul's viewpoint and accurately comprehended the motives and principles that actuated the apostle cannot be assumed. Paul was admired and loved by many, but thoroughly understood by very few in the early church. Luke's aim was not, however, to give a biography of Paul, but, as has been stated, to write a history of the spread of the Gospel, under the guidance of the Spirit, until it reached Rome, the world-capital. So viewed, the author's work must be pronounced a remarkable achievement, one of the greatest books ever written. It is the worthy companion and sequel to the author's Gospel, in which he set forth "the things Jesus *began* both to do and teach" (Acts i, 1).

Bibliography.— Besides the standard commentaries, e. g., by H. H. Wendt in the Meyer-Weiss series (in German), by R. J. Knowling in the 'Expositor's Greek Testament,' by J. R. Lumby in the 'Cambridge Bible,' or by J. Vernon Bartlett in 'The New Century Bible,' the most up-to-date discussions will be found in 'The Acts of the Apostles,' by A. Harnack (London 1909); 'Introduction to the Literature of the New Testament,' by James Moffatt (New York 1911), and 'The Composition and Date of the Acts of the Apostles,' by C. C. Torrey (Cambridge 1916).

The following works also may be consulted: COMMENTARIES: Andrews, in 'The Westminster New Testament' (New York and London 1908); Holtzmann, H. J., 'Hand-Kommentar zum Neuen Testament' (Freiburg 1892); Gilbert, in 'Bible for Home and School' (New York 1908); Lietzmann, 'Handbuch zum Neuen Testament' (Tübingen 1908). INTRODUCTIONS: Bacon, in 'New Testament Handbook Series' (New York 1903); Von Soden 'Early Christian Literature' (ib., 1906). GENERAL WORKS: Balmer, 'Die Romfahrt des Apostels Paulus und die Seefahrtskunde im römischen Kaiserzeitalter' (Bern–Münchenbuchsee 1905); Chase, 'The Historical Credibility of the Acts of the Apostles' (London 1902); Clemen, 'Die Apostelgeschichte' (Giessen 1905); Ritschl, 'Die Enstehung der altkatholischen Kirche' (Bonn 1857); Ramsay, 'The Church in the Roman Empire before 170 A.D.' (New York 1893); Weizsäcker, 'The Apostolic Age' (Edinburgh 1894); 'Date of Acts and the Synoptic Gospels' (New York and London 1911).

EDWARD E. NOURSE,
Professor Biblical Theology, Hartford Theological Seminary.

ACTS OF CONGRESS. The two branches of Congress are co-ordinate in legislative power, the bills passed by either being subject to the absolute veto of the other. The only exclusive power possessed by either House was the provision that all bills for raising revenue should originate in the House of Representatives, but this power has practically been nullified by the unrestrained freedom of amending such bills which the Constitution gives to the Senate. In one case this freedom was exercised to the extent of placing 872 amendments in a single House bill and of eliminating everything but the enacting clause and substituting a new bill. Annually many thousands of bills and resolutions are introduced by the Senators and Representatives (during the 61st Congress nearly 46,000), are then referred to the proper committees for consideration, and if worthy of presentation and action by Congress are introduced for debate. While the congressional committee system is crude, it performs excellent work in killing off worthless bills. When a bill has been passed by either House it is sent to the other for action; if passed by that branch the "enrolled" copy, signed by the President of the Senate and the Speaker of the House, is sent to the President. If he sign it or allow it to become a law, it takes effect at the time designated in the bill, but if he veto it, then it must be passed by a two-thirds vote of those present in both Houses before it can become a law without his signature. If the bill fail to receive the two-thirds vote it is then a nullity and has no effect. (See BILLS, COURSE OF; BILLS, PRIVATE). All acts of Congress for each session are edited, printed and published by authority of Congress, under the discretion of the secretary of state, in the 'Statutes at Large.' All acts of Congress remaining in force 1 Dec. 1873 were codified in 1874 in the 'Revised Statutes' and from time to time successive volumes of supplementary acts have been issued. The criminal laws of the United States were codified in 1912. Consult Hart, A. B., 'Actual Government' (New York 1903); Reinsch, P. S., 'American Legislatures and Legislative Methods' (New York 1907); Bryce, James, 'American Commonwealth' (4th ed., New York 1910); Ford, H. J., 'Cost of Our National Government' (New York 1910); Hinds, A. C., 'Rules of the House of Representatives' (1909).

ACTS OF HOSTILITY, actions of one nation against another signifying its intention to impose its will by force, not always physical. Acts of hostility may be of a diplomatic, commercial, civil or military character. An ultimatum delivered by one nation to another, whose terms are so harsh as to be utterly unacceptable, may be termed an act of hostility, in a diplomatic sense. The blockade of a country's ports against food supplies is an act of hostility in a commercial sense, though not a shot may be fired. A military act of hostility usually involves actual invasion, as the raiding of Columbus, N. M., by the Mexican Villa, though in that case the Mexican Government was not considered responsible for his act.

ACTS OF PARLIAMENT. An act of Parliament is a resolution or law or declaration passed by all three branches of the British legislature (the king or queen, lords and commons) to enforce certain or specified rules of conduct or defining and conferring rights upon persons or withholding them from certain persons or classes of persons. In acts other than those granting money to the Crown, the enacting clause reads: "Be it enacted by the King's most excellent Majesty, by and with the advice and consent of the Lords Spiritual and Temporal and Commons in this present Parliament assembled, and by the authority of the same." When money is granted to the Crown the enacting clause is prefaced by the words: "Most gracious Sovereign, we, Your Majesty's most dutiful and loyal subjects, the Commons of the United Kingdom of Great Britain and Ireland, in Parliament assembled, towards making good the supply which we have cheerfully granted to

your Majesty in this session of Parliament, have resolved to grant unto your Majesty the sums hereinafter mentioned; and do therefore most humbly beseech your Majesty that it may be enacted," etc. Thus the collective body of such declarations is the written law or statutes of the realm of the British nation and is the highest legal authority recognized, which cannot be amended or repealed without the same authority of Parliament. It binds every subject and every alien (with few exceptions) and, if named therein, the sovereign himself. Unless a specific date be set by the act itself, an act of Parliament takes effect immediately on receiving the sovereign's signature. Acts of Parliament are either public or private. A public act is one relating to the whole Empire or a main subdivision (in which case it is called general) or a subordinate part (in which case it is called local). Private acts are those which relate to particular persons and private concerns. (See BILLS, PRIVATE). Originally the whole number of acts passed during each session constituted a single statute having a general title and for this reason acts of Parliament are referred to by the year of the sovereign's reign and the chapter of the statutes of that year, e. g., 2 and 3 Richard III, c. 45. Since the passage of the Short Titles Act of 1892 important acts up to that time may be cited by their short titles, either individually or collectively. Most of the recent acts have borne short titles. See GREAT BRITAIN — PARLIAMENT.

ACTS OF TRADE, a series of acts to regulate trade passed by the British Parliament between 1660 and 1674. These acts levied heavy duties in England on agricultural products and salt provisions imported from the colonies. The intent was to protect the British landlord, but the actual result was to force the colonists to seek other markets where they could exchange their produce for manufactured materials and eventually to erect their own manufactories. On non-colonial importations heavy or prohibitory duties were imposed to give protection to colonial products which were admitted into England under nominal duties. Enumerated goods (such as sugar, tobacco, cotton, hemp, grain, meats, indigo, ginger, fustic, molasses, South Carolina rice, etc.) were required to be shipped to England and heavy duties were levied upon intercolonial trade so as to force the shipment of such articles to England. In order to prevent trade with other countries or their colonies and to encourage the colonial production of articles obtained therein, heavy prohibitory duties were laid on all non-English goods imported into the colonies. The colonies were either greatly restricted in their production of or prohibited altogether to manufacture woolens, linens, hats, iron and many of its products, since the manufacturers of the mother country greatly feared the competition of the colonists in these articles. Indeed the imposition of a duty on English manufacturers by Massachusetts and a slight discrimination in favor of her shipbuilding industry led the British ship-builders to exclaim that the colonists would soon "be able to live without Great Britain; and their ability, joined to their inclination, [would] be of very ill consequence." But the colonies were benefited to a degree by the two bounties granted by the government: First, that paid directly to the colonists to encourage the production of indigo in South Carolina and of naval stores, such as masts, hemp, flax, lumber, pitch and tar; and second, that paid to British manufacturers which reduced the prices to colonial consumers. Irish linen was allowed to be shipped to the colonists duty free, salt needed for curing fish might be imported from any European port, and drawbacks were allowed on goods warehoused in England and then shipped to the colonies. The colonists were allowed later to ship grain, lumber, salt provisions, fish, sugar and rum to any port in the world, provided these goods were carried in English or colonial ships, of which the owners and three-fourths of the crews were British subjects.

At first the acts of trade were so unproductive of revenue that the funds raised thereby in the colonies did not pay the costs of administration, but in 1764 a statute known as the "Sugar Act" was passed containing the provisions of the previous "Molasses Act," and an attempt was made to collect the duties which had been placed purely on a revenue basis. This indicated that the home government intended to convert the acts of trade into revenue acts, which later was demonstrated by the passage of the Stamp Act (q.v.) and the Townshend Acts. These were among the contributing causes of the Revolutionary War. See UNITED STATES — CAUSES OF THE REVOLUTION; GREAT BRITAIN — NAVIGATION ACTS; VIRGINIA CONVENTIONS OF THE REVOLUTION; STAMP ACT; DECLARATION OF INDEPENDENCE. Consult Beer, G. L., 'Commercial Policy of England Toward the American Colonies' (in Columbia University 'Studies in History, Economics and Public Law,' Vol. III, No. 2, 1893), 'British Colonial Policy, 1754–1765' (1907), and 'The Old Colonial System, 1660–1764' (1912); Osgood, H. L., 'The American Colonies in the 17th Century' (1907); Doyle, J. A., 'English Colonies in America' (1882–1907); Andrews, C. M., 'Colonial Self-Government' (1904); Howard, G. E., 'Preliminaries of the Revolution' (1905); MacDonald, William, 'Select Charters' (containing text of some of the acts); Lord, E. L., 'Industrial Experiments in the British Colonies of North America' (in Johns Hopkins University 'Studies in History and Political Science,' Extra Vol. XVII, 1898); Bruce, P. A., 'The Economic History of Virginia in the 17th Century' (1896); Weeden, W. B., 'Economic and Social History of New England' (1890).

ACTUALITY, LAW OF, in philosophy, the state of being actual; reality. "The actuality of these spiritual qualities is thus imprisoned, though their potentiality be not quite destroyed."— Cheyne.

ACTUARIAL SOCIETY OF AMERICA, a scientific organization established in April 1889, having for its object the promotion of actuarial science by such methods as may be found desirable. The membership is composed of those connected with actuarial pursuits. The enrolment is divided into fellows and associates. Candidates for associate must be nominated to the council by at least two fellows of the society, and after their nomination has been approved are required to pass such preliminary examination as may be pre-

scribed; a second examination is demanded of candidates for fellowship. An annual meeting is held on the first Thursday after 14 May in each year. Other meetings may be called by the council from time to time and by the president at any time on the written request of 10 fellows. The officers of the society are a president, a first and second vice-president, a secretary, a treasurer and an editor of the 'Transactions.' President and vice-presidents are not eligible for the same office for more than two consecutive years. The council is composed of the officers, ex-presidents and nine other fellows, three elected to serve for three years, three for two years and three for one year. The society publishes 'Transactions,' containing the proceedings of the meetings, including original papers presented by fellows or associates, discussions on said papers and other matter expressly authorized by the council. In 1911 the total number of fellows was 144; that of associates, 113. Enrolment is not restricted to the United States. International congresses are held from time to time under the auspices of the society. Office of the secretary, 346 Broadway, New York.

ACTUARY, in ancient Rome, a clerk of public bodies who recorded their *acta;* also one of the public reporters who prepared the daily news of the city as a written newspaper. (See ACTA DIURNA). In modern times, the mathematician of an insurance company, who makes the calculations on which its policy plans and prices are based, and applies the doctrine of probabilities to fire, life or accident insurance. Although the material on which he works is theoretically furnished by the experience of his and other cognate companies, and the records of public and private bodies, with the common rules of interest, in fact it needs not only great mathematical capacity but great practical sagacity to apply them to actual business; and no actuary of the highest class is a mere mathematician. In the early days, when experience was still mostly to make, the actuaries were usually the presidents of their companies; in recent times a safe body of experience has accumulated which enables business men to head them, and the actuary's computations and advice relate to slighter variations or special plans. In accident companies the actuary needs to be and usually is a man of large practical acquaintance with different employments, their hazards, the meaning of given employment-names, and those under which the more hazardous employments are disguised as less so; in fire insurance equally he must know the character of different risks. See INSURANCE.

ACUÑA, Christoval de, ä-koon'yä, chrĭs'-tō-vâl, Spanish missionary and South American explorer: b. Burgos 1597; d. 1676. After mission work in Chile and in Peru, he became rector of the College of Cuenca. In 1639, as scientist, he accompanied the second expedition of Texeira to explore the Amazon, and wrote his 'Nuevo Descubrimiento del Gran Rio de las Amazonas.' The work was published at Madrid in 1641, a French translation in 1682 and an English translation from the French edition in 1698.

ACUNA, Manuel, a-koon'yä, măn-oo-el', Mexican poet: b. 1849; committed suicide 1873 from disappointed love, which was the principal theme of his poems.

ACUÑA DE FIGUEROA, Francisco, ä-koon'yä dā fē-gä-rōä, frän-thēs'kō, Uruguayan poet: b. Montevideo 1791; d. there, 6 Oct. 1862. His works are a Spanish-American classic from their metrical perfection, though deficient in warmth. The collection 'Poetic Mosaic' comprises every variety of secular and religious poetry, from heroic poems to psalms.

ACUPUNCTURE, an old remedy for the relief of pain, swelling or dropsy. Steel needles about three inches long are used. One or more are inserted by the surgeon to the required depth and are left there from a few minutes to an hour. The result is a great relief from pain and, provided the needles are aseptic, the wounds are entirely harmless. Electric currents are sometimes sent into the needles to remove birthmarks, moles, etc., and some needles are made hollow so that a sedative may be administered and pain relieved at once.

ADA, Okla., county-seat of Pontotoc County, about 75 miles southeast of Oklahoma City, on the St. Louis & San Francisco, the Missouri, Kansas & Texas and the Oklahoma Central railways. Its industries include the manufacture of cement and asphalt. Cotton is raised extensively in the vicinity. Here is situated the State Normal School. The citizens have adopted the commission form of government, and the municipality owns its own waterworks. Pop. 5,000.

ADABAZAR, ä'dä-bä'zär, Turkey in Asia, town in the Kohja Ili sanjak, an active commercial centre on a branch of the Anatolian Railway, and on the military road from Constantinople. It has silk and linen industries, and trades with Constantinople in tobacco, cocoons, walnut wood and vegetables. Its annual imports are valued at $400,000; its exports at $2,400,000. Pop. 18,000 (Christians, 8,000; Mohammedans, 10,000).

ADAGIO, ä-dä'jō, a musical term denoting a slow movement or measure of time, between largo, grave and andante. In more extended compositions of instrumental music the second or third movement is generally marked adagio, and serves as a contrast to the rapid and energetic movement of the preceding and following parts of the sonata or symphony. It must be written in a measure of time which will afford scope for a flowing and expressive slow melody with a gracefully varied accompaniment. A clear and expressive execution of an adagio is an infallible test of a performer's art, as it demands a pure and beautiful tone and calls for great variety of tonal color. The diminutive adagietto is no longer used as denoting a tempo slightly more animated than adagio, but as a generic title for a short adagio movement.

ADAIR, James, American 18th-century Indian trader and author. He lived 1735–75 among the Indians, mainly the Cherokees and Chickasaws, and in the latter year published a 'History of the Indian Tribes,' especially the southeastern ones, containing an admirable first-hand account of their manners and customs, and a still more valuable, though unsatisfactory, set of Indian vocabularies. But the

chief object of writing the book was to trace the origin of the Indians to the Lost Tribes of Israel; a curious phantasm (especially as the tribes are known not to have been lost, and the differentiation of stocks must far antedate the Christian era) which has bewitched many enthusiasts since, and was revived and expounded by Dr. Elias Boudinot in his 'Star of the West' (1816). Adair's views are summarized in H. H. Bancroft's 'Native Races' (Vol. V, p. 91).

ADAIR, John, American general and public officer: b. Chester County, S. C., 1759; d. Harrisburg, Ky., 18 May 1840. He served in the Revolution; removed to Kentucky 1787; in 1791 was major under St. Clair and Wilkinson in the northwestern Indian expeditions, and was defeated by the Miami chief "Little Turtle," near Fort St. Clair. He was a member of the constitutional convention which made Kentucky a State, 1 June 1792; was State Representative and Speaker, register of the United States Land Office, and 1805–06 United States Senator. He was volunteer aide to General Shelby at the battle of the Thames, 5 Oct. 1813; made brigadier-general of State militia November 1814, and as such commanded the State troops at New Orleans under Jackson, 8 Jan. 1815. He was governor of Kentucky 1820–24, and United States Representative 1831–33, on the committee on military affairs.

ADAIR, Robin. See ROBIN ADAIR.

ADALBERT, or **ALDEBERT,** a native of France, who preached the gospel in 744 on the banks of the Main. He is remarkable as the first opponent to the introduction of the rites and ordinances of the Western Church into Germany. He rejected the culture of the Saints and Confession, but distributed his own hair as sacred relics to his followers; was accursed of heresy by Boniface the apostle of Germany, and condemned by two councils, at Soissons in 744 and at Rome in 745. Finally escaping from prison, he is said to have been murdered by some peasants on the banks of the Fulda.

ADALBERT, SAINT, OF PRAGUE, the apostle of Prussia proper: b. 939; d. 23 April 997. He was the son of a Bohemian nobleman, and his real name was Voitech ("host — comfort"); was educated in the cathedral of Magdeburg, and appointed the second bishop of Pragus in 983. He labored in vain to convert the Bohemians from paganism, and to introduce among them ordinances of the Church of Rome. Discouraged by the fruitlessness of his pious zeal, he left Prague (988) and lived in convents at Monte Casino and Rome until the Bohemians in 993 recalled him; but after two years he again left them, disgusted with their barbarous manners. He returned to Rome, and soon followed the Emperor Otho III to Germany; on which journey he baptized, at Gran, St. Stephen, afterward king of Hungary. He proceeded to Gnesen to meet Boleslas, Duke of Poland. Being informed that the Bohemians did not wish to see him again, he resolved to convert the pagans of Prussia, but was murdered by a peasant near what is now Fischhausen. His body was bought by Boleslas for its weight in gold, and became famous for its miraculous power. Its influence was greater than that of the saint himself; the Bohemians, who had refused to receive the ordinances of the Church, now suffered them to be introduced into Prague, on the sole condition that these miraculous relics should be transferred to their city. They were rediscovered in a vault in 1880 and deposited in the cathedral. Consult 'Life' by Heger, (Königsberg 1897); Voigt (Berlin 1898).

ADALBERT, "THE GREAT," archbishop of Bremen and Hamburg: b. about 1000; d. 17 March 1072; descendant of a Saxon princely house. He received his office in 1043 from the Emperor Henry III whose relation, friend and follower he was. He accompanied Henry to Rome in 1046 and was a distinguished candidate for the papal chair. Pope Leo IX made him his legate in the north of Europe (1050). He superintended the churches of Denmark, Norway and Sweden, converted the Wends, and aspired to a great northern patriarchate to vie with the Roman Curia. During the minority of Henry IV he usurped, in consort with Hanno, archbishop of Cologne, the guardianship of the young prince and the administration of the empire, and gained an ascendency over his rival by indulging the passions of his pupil. After Henry had become of age Adalbert exercised the government without control in his name. His pride and arbitrary administration induced the German princes in 1066 to remove him by force from the court; but after a short contest with the Saxon nobles, who laid waste his territory, he recovered his former power in 1069, and held it till his death in Goslar in 1072. His injustice and tyranny were instrumental in producing the confusion and calamities in which the reign of Henry IV was involved.

ADALIA, ą-dā'lēa, Turkey in Asia, a seaport on the south coast, in the vilayet of Konieh, finely situated on the Gulf of Adalia, from which the houses rise in terraces like an amphitheatre, on a rocky hill and surrounded by fig, orange and mulberry gardens. It lies in a fertile but hot and unhealthy locality, producing grain, figs, oranges, wine, etc. It has a small but good port, and carries on a considerable trade, exporting grain, timber, cattle, volonia, etc. It was anciently called Attalia, later Satalia. Pop. about 30,000, 7,000 Greeks.

ADAM ("one made") and **EVE** ("living being," feminine). As the Old Testament almost invariably uses the article before "adam" ("the adam" = "the made one" or "the man"), its use as a personal name is a mere misapprehension, and the implications drawn from it are no part of the text; nor is there any reason to suppose it was so intended by the writers who used it, or so understood by the Jews. This, however, is a minor point, as the narratives of the creation and fall, etc., have the same bearing whether the first created beings had names or not; they remain themselves no less. But those narratives were certainly not understood by their compilers themselves, who merely took them from Babylonian sources (See CREATION), as implying literal history — which their discordance should render obvious — and the difficulties involved in it result from being more Biblical than the Bible, as the Yahvistic portions of the later chapters disregard them, and the Yahvish adds to them at will. The accounts

in Genesis are three: (1) The Elohistic (q.v.), in which "male and female" are created at the same time; that is, the whole race, just as the whole animal race is created at a stroke. The interpretation as "one couple" is thrown back from the second account. (2) The Yahvistic, in which "the adam" is made from the dust, and "the eve" from the adam; and which contains the theological part of the story — the location in the Garden of Eden, the prohibition of God and its disregard, the expulsion, the birth of Cain and Abel, and the first murder. (3) The genealogical list in chapter v, where the race is derived through Seth, and Cain and Abel are unknown; and where the first generations of men are demigods with enormous spans of life. The last is not only later than the other two, and corresponding to Greek, Assyrian, etc., pedigrees carrying the race or its first families back to the gods, but it is entirely unconnected with the first two, which have a certain relation as efforts of early man to account for the origin and propagation of life on the earth, which every race has undertaken as soon as it attained self-consciousness. The first, however, is that pure and simple, with no ulterior purpose. The second is quite other, combining the creation story of a single couple, the progenitors of the human race — as with the Greek Deucalion and Pyrrha, etc.— with a deeply moralized account of the origin of moral evil, and the rapine and violence, pain and disease and hardship, which it brought into a world previously free from them. It is this, reflecting the predominant religious tone of the Jewish mind, that has formed the basis first of the Jewish and then of its successor the Christian theology: Adam as the reason for and spring of human sin. This resulted in Paul's conception of two Adams: the fleshly one, whence come sin and death; and the spiritual one, whence springs salvation.

Most of the later Jews regarded the story as an allegory. Philo, the foremost writer of the Alexandrian school, explains Eve as the sensuous part, Adam as the rational part, of human nature. The serpent attacks the sensuous element, which yields to the temptation of pleasure and next enslaves the reason. Clement and Origen adapted this interpretation somewhat awkwardly to Christian theology. Augustine explained the story as history, but admitted a spiritual meaning superinduced upon the literal; and his explanation was adopted by the reformers, and indeed generally by the orthodox within the Catholic and the various Protestant Churches alike. More modern critics, loath to abandon it wholly as legend, have sought to separate a kernel of history from the poetical accretions, and attribute the real value of the story not to its form, but to the underlying thoughts. Martensen describes it as a combination of history and sacred symbolism, "a figurative presentation of an actual event." The second narrative may be regarded as embodying the philosophy of the Hebrew mind applied to the everlasting problem of the origin of sin and suffering, a question the solution of which is scarcely nearer us now than it was to the primitive Hebrews. Hesiod describes man in his primitive state as free from sickness and evil before Prometheus (q.v.) stole fire from heaven, and Pandora (who corresponds to Eve) brought miseries to the earth. Prometheus gives man the capability of knowledge; his daring theft is for man the beginning of a fuller and higher life. Æschylus regards Prometheus as the representative of humanity led into misery by his self-will until he submits to the higher will of God. This corresponds with the story of Genesis, save that in the latter the spiritual features are clearer and more distinct. Consult Jeremias, 'Das Alte Testament im Lichte des alten Orients' (1906); Schrader, 'Die Keilenschriften und das Alte Testament' (1902); Wünsche, 'Der Mid-rasch Rabba zu Genesis' (1882).

ADAM, Alexander, Scottish classical scholar and author: b. Forres, 24 June 1741; d. Edinburgh, 18 Dec. 1809. In 1768 he became rector of the High School, Edinburgh, and among his pupils were Sir Walter Scott, Lord Brougham and Jeffery. Edinburgh University conferred upon him an honorary LL.D. in 1780. His chief work, 'Roman Antiquities,' (1791) passed through several editions and was translated into German. He also wrote 'Principles of Latin and English Grammar' (1772); 'A Summary of Geography and History' (1794); and a 'Compendious Dictionary of the Latin Tongue' (1805).

ADAM, Graeme Mercer, Canadian author and editor: b. Scotland 1839; d. 1912. He was trained in Blackwood's publishing house in Edinburgh, and, emigrating, became a publisher in Toronto and New York. He later edited several Canadian periodicals, assisted Goldwin Smith on the *Bystander,* and founded with him the *Canadian Monthly* (1872). In 1879 he founded the *Canadian Educational Monthly.* In 1896 he became editor of *Self-Culture.* He wrote 'An Outline History of Canadian Literature' (1886); 'The Canadian Northwest' (1895); and with Ethelwyn Wetherald, the historical novel 'An Algonquin Maiden'; etc.

ADAM, Juliette, ad-äṅ, zhü-lē-et (MME. ADAM, née LAMBER), Parisian journalist and author: b. Verberie, Oise, 4 Oct. 1836. She founded in 1879 the *Nouvelle Revue,* the organ of the Extreme Republicans, and edited it till her retirement in 1897; and her salon was a noted influence in Paris. Her second husband, Edmond Adam (later life senator, d. 1877), was prefect of police in Paris during the Prussian siege, and her first book was 'Le siège de Paris, journal d'une Parisienne' (1873). She has written largely (often under the pseudonyms Juliette Lamber and Comte Paul Vasili) on women's rights and various literary and social subjects; novels assailing Christianity for its crucifixion of natural instincts; 'The Hungarian Fatherland' (1884); 'General Skobeleff' (1886); 'Apres l'abandon de la revanche' (1910); 'Impressions françaises en Russie' (1912).

ADAM, ād'ām, **Lambert Sigisbert,** "Adam l'ainé — the elder," French sculptor: b. Nancy 1700; d. Paris 1759. The son of a provincial sculptor, he won the Prix de Rome in 1723. His masterpiece, "The Triumph of Neptune Stilling the Waves," is at Versailles. His brother ADAM NICOLAS SÉBASTIEN, "Adam le jeune — the younger": b. 1705; d. 1778; also achieved fame as a sculptor. His chief work is the mausoleum of the Queen of Poland, Catherine Opalinska, wife of King Stanislaus, at Nancy. Another brother, ADAM, FRANÇOIS GASPARD BALTHASAR: b. 1710; d. 1761; was

court sculptor to Frederick the Great at Berlin, and his works embellish the palaces and gardens of Potsdam and Sans Souci. Consult Lady Dilke, 'French Architects and Sculptors of the Nineteenth Century' (London 1900).

ADAM, ad-äṅ, **Paul,** French author: b. Paris, 7 Dec. 1862. His first book, 'Chair molle,' a novel of the realist school, for which he was prosecuted and acquitted, appeared in 1885. His succeeding works, chiefly of the symbolist school include 'Robes rouges' (1891); 'Le mystère des foules' (2 vols., 1895), a study of the Boulangist period; 'La bataille d'Uhde' (1897); 'Letters de Malaise' (1897); and four historical novels, 'La force' (1898); L'enfant d'Austerlitz' (1902); 'La ruse' (1903); 'Au soleil de Juillet' (1903). Other works are 'Basile et Sophia,' a Byzantine romance (1900); 'La Ville inconnue' (1911); and a problem novel, 'Stephanie' (1913).

ADAM, Book of, works dealing with Adam and Eve and the story of the Creation. One of the earliest of these, supposed to have been called 'The Life of Adam and Eve,' and of Hebrew origin, was published in Greek by Tischendorf in 'Apocalypses Apocryphæ' (1866) under the misleading title of 'Apocalypses of Moses,' because in the introduction the story is said to be recorded to Moses and later by Ceriani, in his 'Monumenta sacra et profana' (1868). Conybeare, in the *Jewish Quarterly Review* (1895), has presented an English version of this work, translated from an Armenian text. An old Slavic version has been published with a Latin translation by Jagić in 'Denkschriften der Wiener Akademie der Wissenshaften' (1893). There is also a Latin 'Vita Adæ et Evæ,' of which the best text is that published by Meyer in 'Abhandlungen der Bayrischen Akademie der Wissenshaften' (1878). This work relates the story of the Creation, the Fall, the penitence of Adam and Eve, their restoration to divine favor and their death and burial. Apparently it dates from the 1st century before Christ and was written either in Hebrew or Aramaic. The 'Conflict of Adam and Eve' is obviously of Christian origin. An Ethiopic version, translated from the Arabic, has been preserved. The Ethiopic text has been published by Trumpp in 'Abhandlungen der Münchener Akademie der Wissenshaften' (1881). Translations were published by Dillman: 'Das Christliche Adamsbuch des Orients' (1853); Migne's 'Dictionnaire des apocryphes' (1856); Malan's 'Book of Adam and Eve' (1882). There is manuscript copy of the Arabic text in Munich. An earlier version of this work is 'The Treasure Cave,' published by Sachau, first in German, 'Die Schatzhöhle' (1883), then in Syriac (1888). The Arabic text was published by Mrs. Gibson in 'Studia Sinatica' (1901). Another work of Christian origin is in Syriac, 'The Testament of Adam,' published by Renan, with a French translation, in 'Journal Asiatique' (1853). Of this work Bezold published Arabic and Ethiopic versions in 'Orientalistche Studien Nöldeke gewidmet' (1906 p. 893). Renan proved conclusively that the original version had been written in Greek. Consult Fuchs. in Hennecke's 'Neutestamentliche Apokryphen' (1904); Ginzburg, in the 'Jewish Encyclopædia,' under the title "Adam, Book of"; Schürer, 'Geschicte des jüdischen Volkes' (1901, p. 396).

ADAM BEDE, the first long novel of George Eliot (MARY ANN EVANS), was published in 1859. The action takes place in the English village of Hayslope, where the hero, Adam, a simple workman of sterling worth, pursues his trade of carpentry. Very different from Adam is his brother, Seth, a gentle and loving spirit, whose religious emotions have been strongly engaged by Methodist revival of the time. Seth is devotedly in love with the leading exponent of the sect in the Hayslope community, Dinah Morris, but she, consecrated to her work of evangelical preaching, refuses to think of him except with sisterly and religious affection. Adam loves Hetty Sorrel, a beautiful but vain and shallow country girl, who encourages him but secretly hopes to make a much loftier marriage. When young Arthur Donnithorne, son of the village squire, falls in love with her, both her passion and her ambition are stirred. Arthur, who is kind-hearted but weak-willed, tries to resist his infatuation, but finally yields to it. When Adam discovers them together there is a stormy scene between the two men, and Arthur agrees to tell Hetty that he can never marry her. Hetty, in her loneliness after Arthur's departure, becomes engaged to Adam, not knowing that she is to be a mother. When at last she realizes her condition she goes to Windsor in search of Arthur. Finding, after a painful journey, that he has gone to Ireland, she wanders miserably to seek Dinah. The scene now changes to Hayslope, where the girl's long absence has aroused anxiety, and the reader learns, with Adam, that she is in prison, charged with the murder of her child. She is condemned to death, but at the last moment, when, supported by Dinah, she is going to the gallows, her sentence is commuted to transportation, the release from death being brought by Arthur Donnithorne. The subject of Hetty's sin is handled with peculiar delicacy, and her wretched journey is one of the most poignant incidents of fiction. The story ends with the marriage of Adam and Dinah, who have been unconsciously drawn together from the first.

The characters in the story, simple country people as they are, working on the farm or in the shop, are portrayed with unusual distinctness, and their appeal is direct and powerful. The analysis of Hetty's character is particularly keen. In the midst of pity for her fate the reader is never allowed to forget the girls' shallowness and selfishness. Finely contrasted with Hetty is Dinah Morris, in her purity and selflessness. But the dominant figure is Adam Bede himself, level-headed and iron-willed, morally uncompromising, finding his best religion in work well done. The theme of the inevitable consequences of wrong-doing, which is ever present in George Eliot's novels, is strongly emphasized, and the story as a whole is not to be forgotten.

Bibliography.—"George Eliot as Author," by R. H. Hutton, in 'Some Modern Guides of English Thought'; "Essays on George Eliot," by E. Dowden, in 'Studies in Literature,' and by W. C. Brownell, in 'Victorian Prose Masters.'

JAMES H. HANFORD,
Associate-Professor of English, University of North Carolina.

ADAM FAMILY, British architects, a celebrated 18th-century family consisting of William and his four sons, William, Robert, James and John: of whom Robert ranks first and James next. The father was born in Fifeshire, Scotland, and his work was done in his native country: the town hall at Dundee, the library and university at Glasgow, and many other public and private buildings there and in Edinburgh, etc. Robert was born in Edinburgh, studied in Italy, and examined the noble remains of Dalmatia before settling in London; his work on Diocletian's palace at Spalato was a valuable advertisement to his talents and taste, and all the brothers increased their repute by publishing engravings of their plans. Under Robert's direction they constructed a great number of buildings in London,—the Adelphi Terrace and the streets around commemorates them specifically. He also did much to remodel the appearance of the city. Robert also built Lansdowne House, Kedleston Hall near Derby and Register House near Edinburgh. A special feature of the brothers' work was their careful attention to harmonious interior arrangement and decoration.

ADAM DE LA HALE, or **HALLE,** ad-äṅ duh lä äl, French poet and composer: b. Arras about 1235; d. Naples about 1287; nicknamed the Hunchback of Arras, although he was not deformed. His satirical extravaganza, 'The Play of Adam, or the Play in the Arbor' (1262), constitutes the earliest comedy in the vulgar tongue; while the pastoral drama, 'The Play of Robin and of Marion,' may be looked upon as the earliest specimen of comic opera.

ADAM HOMO, a poem by Frederik Paludan-Müller, and his most important work, appeared during the years 1841–48. It is of particular significance in Danish literature, as it marks the end of Romanticism in Denmark. In Oehlenschlaeger's 'Aladdin' which introduces the period of Romanticism, imagination is given full play; in 'Adam Homo' cool reason prevails. Oehlenschlaeger points to Aladdin, the favorite of fortune; Paludan-Müller shows us Adam Homo, man as he really is. (The name of the poem suggests that the hero represents the average man, as we find him in every-day life. Human life as it is, contrasted with the ideal, is the theme of the book). For 'Adam Homo' is realistic, and presents modern life with all its ugliness and wickedness. With shocking truthfulness the author shows how one may lose sight of ideals and squander a spiritual heritage. Adam is the son of a minister in Jutland, who over-emphasizes the material things of this world. His mother, a spiritual woman, tries to interest her boy in the higher life. While Adam studies at Copenhagen, his nobler impulses are kept alive by the loving letters of his mother and by his association with a pure-minded young woman. Unfortunately Adam succumbs to the temptations of new conditions, and almost without being aware of the fact he gradually loses sight of his ideals, and makes material gain and social recognition the goal of his efforts. Though he becomes a man of distinction in society, he leads a sordid life, for his enthusiasm for truth, beauty and goodness is gone. Consult V. Andersen, 'Paludan-Müller'; Georg Brandes, 'Aesthetiske Studier' (pp. 191–222); Georg Brandes, 'Danske Digtere' (pp. 251–313); P. Hansen, 'Illustreret Dansk Litteratur Historie' (pp. 295–303); Karl Mortensen, 'Litteratur Historie' (pp. 248–261); Torvald Ström, 'Dansk Literaturhistorie' (pp. 286–291).

JOSEPH ALEXIS,
Professor of Germanic Languages and Literatures, University of Nebraska.

ADAM OF BREMEN, German historian: b. probably in Meissen, Saxony; d. 12 October of an unknown year, probably 1076. He lived at Magdeburg, removed to Bremen in 1067, was made canon of its cathedral and next year principal of the cathedral school. His fame rests on his 'History of the Church of Hamburg' (1072–76), an inestimable mediæval classic, for which he gathered material far and wide; making a special trip to Denmark to interview King Svend Estridson, whose communications he gives. As an appendix to his last book he gives an account of the Danish, Swedish and Norwegian possessions, containing a passage of the first interest to Americans, as verifying the Saga stories of Vinland: "He [Svend] told of still another island found by many in that [Atlantic] ocean. It is called Wineland, because grapes grow there spontaneously. . . . I have learned through definite information from Danes that unsown crops also grow there in abundance."

ADAM OF ST. VICTOR, famous mediæval hymnologist: d. in Paris c. 1192; nothing is known of him save his great hymns, the most numerous of any mediæval writer, and among the foremost in rank. A few have been finely translated by J. M. Neale; a complete (so far as known) edition from the French of Léon Gautier was published in London (3 vols., (1881). Consult Duffield, 'Latin Hymns' (1888); French, 'Sacred Latin Poetry' (1874); Julian, 'Dictionary of Hymnology' (1888).

ADAMANT, a word loosely used to signify a substance of extreme hardness. It is probably derived from the Greek *adamas,* "unconquerable." Very possibly the name adamant was at one time applied to a definite substance; but it has been used to signify corundum, various gems, a hard metal (probably steel) that was used in making armor, the lodestone and various other substances. It is now chiefly used in a poetical or rhetorical sense.

AD'AMAN'TINE SPAR, a name sometimes applied to corundum (q.v.) on account of its hardness; especially to the dark colored, non-transparent varieties which are used in pulverized form for polishing gems.

ADAMAN'TOID, a crystalline form belonging to the isometric system, and bounded by 48 similar scalene triangles. It has 6 octahedral solid angles, at the extremities of the principal axes; 8 hexahedral solid angles, at the extremities of the trigonal axes; and 12 tetrahedral solid angles, at the extremities of the digonal axes. Its name is due to the fact that the diamond usually occurs in this crystalline form. (Also, and more commonly, called hexoctahedron).

ADAMAWA, ä'dą-mä'wą (formerly FUMBINA), an internally autonomous sultanate of central Africa, between lat. 6° and 11° N., and long. 11° and 17° E.: part of the Sokoto empire in northern Nigeria; area some 50,000 square

miles. Much of the surface is mountainous, the mountains rising to about 8,000 feet. The principal rivers are the Benue and its tributary the Faro. The eastern part belongs to the German Kamerun; the western to British North Nigeria. A great part of the country is covered with thick forests, though there are also extensive and splendid pasture lands and cultivated fields. The native inhabitants are industrious and intelligent, but they have been in a great measure subdued by the Mohammedan Fulahs, who possess innumerable slaves. Slaves and ivory are the chief articles of trade. Pop. about 3,000,000. Chief towns, Yolo the capital, est. 12,000 to 20,000; Banjo, chief ivory mart; and Nganudere.

ADAMI, Friedrich Wilhelm, ä-dä'mē, frēd'riH, German author: b. Suhl, 18 Oct. 1816; d. Berlin, 5 Aug. 1893. He wrote stories, plays, etc., a very popular biography of Queen Louise, 'The Book of Emperor William' (1887–90); 'Ein erlicher Mann' (1850); 'Der Doppel gäuger' (1870), and contributed regularly to the *Kreutzzeitung*. His literary style was much admired.

ADAMI, John George, American pathologist: b. Manchester, England, 1862; educated at Owens College there and Christ's College, Cambridge. He studied at Breslau and Paris; became demonstrator of pathology at Cambridge in 1887, and fellow of Jesus College in 1891. In 1892 he came to Montreal as professor of pathology at McGill University; from 1894 has been head of the pathological department at the Royal Victoria Hospital there; from 1896 lecturer to the New York Pathological Society. He has published papers on pathological topics, and is the author of 'The Principles of Pathology' (1908); 'Inflammation: Introduction to the Study of Pathology' (1910).

ADAMITE (named for M. Adam, a French mineralogist), a mineral, isomorphous with olivenite, and occurring in small orthorhombic crystals that are often grouped in fine granular aggregations. It is an arsenate of zinc, having the formula $Zn_3As_2O_8.Zn(OH)_2$, although copper and cobalt may also be present. Its hardness is 3.5, and its sp. gr. 4.35. Its color is variable. It occurs at Cap Garonne, near Hyères, France; and also at Laurium, Greece, and in certain parts of Chile.

ADAMITES. (1) A Christian sect said to have existed in the 2d century: so called because both men and women appeared naked in their assemblies, either to imitate Adam in the state of innocence or to prove the control which they possessed over their passions. The tradition is probably baseless, originating in a name of derision given to the Carpocratians. (See GNOSTICS). (2) Also called Picards, from the founder of their sect, Picard (perhaps also Beghards). He called himself Adam the Son of God, and advocated community of women. They appeared about the year 1421 on an island in the River Lusinicz, where Zisca surprised them, but was not able to destroy the whole sect. In the following year they were widely spread over Bohemia and Moravia, and especially hated by the Hussites (whom they resembled in hatred toward the hierarchy) because they rejected transubstantiation, the priesthood and the Supper. They subsequently formed one sect with the remaining Taborites, who have accordingly been confounded with them. In 1849 a similar sect sprang up in Austria.

ADAMNAN, Saint (der. of Adam), Irish ecclesiastic and author: b. in Donegal, c. 625; d. 703 or 704. He was descended from a cousin of St. Columba and from powerful Irish chieftains. Entering the monastery of Iona, he became abbot in 697; but was involved in quarrels with his monks over Easter and the tonsure (enforcing the orthodox Roman view against the Irish Church view), which hastened his death. He wrote a most valuable life of St. Columba (q.v.), the founder of Iona, full of historical information about the early Irish-Scotch Church (best edition Reeves', 1857; English translation in the 'Historians of Scotland,' 1874, reissued Oxford 1895); and a hearsay but valuable report of matters in Palestine in his time, the first we have of that land in the early Middle Ages.

ADAMS, Abigail Smith, wife of President John Adams: b. Weymouth, Mass., 23 Nov. 1744; d. 28 Oct. 1818. She was daughter of a Weymouth clergyman, who opposed the match and took for a text "My daughter is grievously tormented with a devil." Though lacking strength and regular school education, she became a self-made force of high order in public affairs and one of the best of early American writers; her letters to her husband, collected and published, are not only of great historical and social value, but full of delightful genial humor and acute comment and judgment. Her husband's position kept them apart for years; but she joined him in France in 1784, went with him to his life of torment in London, and lived in Washington 1789–1801; thence till death at Braintree, now Quincy.

ADAMS, Alvin, founder of Adams Express Co.: b. Andover, Vt., 16 June 1804; d. 2 Sept. 1877. On 4 May 1840 he started an express business between Boston and New York which developed into the great company above named, formed in 1854 by the consolidation of several rival firms,—including Harnden's, the initiator of the express business,—with Mr. Adams as president. In 1850 he helped to organize the pioneer express service through the California mining camps, which on the consolidation above he sold out. In the Civil War the Adams Express Company was of immense help to the government; in 1870 it extended its business to the far West.

ADAMS, Arthur H., Australian journalist, novelist and poet: b. Lawrence, New Zealand, 6 June 1872. He was graduated from Otago University, New Zealand, studied law and became private secretary and literary advisor to C. J. Williams, the noted Australian theatrical manager. Later he went to China as war correspondent for Australian newspapers during the Boxer trouble; and he was in England from 1902 to 1905. Among his published works are: 'Maoriland and other Verses' (1899); 'The Nazarene' (London 1902); 'London Streets' (poems, 1907); Tussock Land' (a novel); and stories, poems and articles in numerous periodicals, magazines and newspapers. In 1906 he became an editor on the *Sidney Bulletin*.

ADAMS, Benjamin Matthias, American clergyman: b. Stamford, Conn., 1824; d. Bethel, Conn., 27 Dec. 1902. He was the son of General Adams and his mother was a daughter of the noted Rev. John J. Matthias. He was educated in a private school in which William Miner, afterward governor of Connecticut, taught. After considerable mental struggle he entered the ministry of the Methodist Episcopal Church and joined the New York Conference in 1848, in which he labored for 17 years. He was then transferred to the New York East Conference. He was a close observer of the habits of birds and nature and lectured on "Fun in Animals." He was a member of the general conference of 1884. He was a personal friend of the Warner sisters. A letter which he wrote to Anna Warner contained a passage which led her to compose the widely known hymn, "One more day's work for Jesus." His ministry, spent in and around New York and Brooklyn, was noteworthy.

ADAMS, Brooks, American writer on sociological themes: b. Quincy, Mass., 2 June 1848. He is a son of Charles Francis Adams (1st), was graduated from Harvard University in 1870 and followed the law for the succeeding year. He is a member of the Massachusetts Historical Society, the Institute of Arts and Letters, etc. In 1900 he published 'The Law of Civilization and Decay,' which has been issued also in French and German, and among his other works are included 'The New Empire' (translated into German and Russian); 'Centralization and the Law' (1906); 'The Theory of Social Revolutions' (1913); 'Charles Francis Adams; an American Statesman,' the last named work being a contribution to the proceedings of the Massachusetts Historical Society for December 1911. His literary fame depends chiefly upon 'The Emancipation of Massachusetts' (1887), a work intended as a philosophic exposition of a theory of social development.

ADAMS, Charles Francis, American statesman, son of President John Quincy Adams: b. in Boston, 18 Aug. 1807; d. there 21 Nov. 1886. At the age of two he was taken by his father to Saint Petersburg; in 1815 went with his mother thence to Paris; the same year his father was made minister to England, and he was placed in an English boarding-school. In 1817 both returned to America; he was placed in the Boston Latin School, and in 1825 he was graduated at Harvard. His father had just been inaugurated President, and he spent two years in Washington; then returned to Boston, studied law with Daniel Webster and was called to the bar in 1828, but never practised — engaging in literature and political writing in magazines and pamphlets, and editing John and Abigail Adams' letters (1840–41). He was Representative in the legislature 1841–44, State Senator 1844–46, as a Whig; heading the "Conscience Whig" wing, he edited the Boston *Whig*, 1846–48, was chairman of the Free-Soil Convention at Buffalo in 1848, and was nominated for Vice-President on the ticket with Martin Van Buren. In 1850–56 he edited John Adams' 'Works' in 10 volumes. He joined the Republican party on its organization in 1855, and in 1858 was sent to Congress, and re-elected in 1860. In 1861 Lincoln sent him to England as minister, as his father and grandfather had been before him. But even their problems were trivial beside his, when the very existence of the Union perhaps depended on how far the English upper classes could drag the government in evasion of international obligations and covert help to the South. The seizure of Mason and Slidell on the Trent nearly precipitated war; the fitting out of cruisers to destroy United States commerce was put a stop to only after the escape of the Alabama (q.v.) in the face of Mr. Adams' representations, and his declaration to Earl Russell, then foreign secretary, that permitting the Laird rams also to leave Birkenhead was "war." Napoleon III's persistent efforts to seduce the English government into a joint intervention in favor of the Confederacy had to be checkmated; and the rancorous hostility of one section and the coldness of the remainder of the best society made it a lonely and trying place, which for seven years he filled with a dignified resolution of immeasurable importance to his country. Returning to America in 1868, he was elected president of Harvard the next year, but declined; for several years, however, he was president of its board of overseers. In 1871 he was the United States representative on the board of arbitrators at Geneva to settle the Alabama Claims (q.v.); in 1872 he nearly obtained the nomination as Democratic-Independent candidate for the presidency, which Horace Greeley secured. In 1874–77 he edited the 'Memoirs of John Quincy Adams' in 12 volumes.

ADAMS, Charles Francis (2d), American publicist, son of above: b. Boston, 27 May 1835; d. Washington, D. C., 20 March 1915. He was graduated at Harvard in 1856, and served as a cavalry officer through the Civil War, rising from first lieutenant to colonel, and being brevetted brigadier-general at its close. Shortly becoming noted for ability in discussion of economic, political and social questions, he was appointed railroad commissioner of Massachusetts in 1869; wrote 'Chapters of Erie' (1871) in collaboration with his brother Henry, a series of papers on railroad accidents and on 'The State and the Railroads' (1875-76) for the *Atlantic Monthly*; 'Railroads, the Origin and Problems' (1878); 'Notes on Railway Accidents' (1879), etc.; and 1884–90 was president of the Union Pacific Railroad Company. In 1892 he published 'Three Episodes of Massachusetts History,' on the settlement of Boston Bay, the Antonomian controversy and early town and church government, and in 1893 'Massachusetts; Its Historians and Its History.' In 1895 he was chosen president of the Massachusetts Historical Society, and in 1901 president of the American Historical Association. He has also written lives of Richard Henry Dana (1891) and of his father (1900, American Statesmen Series), 'Lee at Appomattox,' etc. (1902), and much miscellaneous work. As chairman of the State Park Commission, 1893–95, he contributed materially toward planning out and establishing the great Metropolitan Park System of Massachusetts.

ADAMS, Charles Kendall, American historian and educator: b. Derby, Vt., 24 Jan. 1835; d. 26 July 1902. He removed to Iowa in 1855; was graduated at the University of Michigan in 1861; became assistant professor there 1863–67, and professor of history 1867–85. He studied

abroad 1867–68; in 1869–70 introduced the German seminary method into the United States by establishing the Historical Seminary in the University of Michigan; and was made dean of its School of Political Science when established. In 1885 he succeeded Andrew D. White as president of Cornell; resigned 1892, and till 1902 was president of the University of Wisconsin. He was chief editor of 'Johnson's Universal Cyclopædia,' 1892–95. His most valued work is a 'Manual of Historical Literature' (1882); he wrote also 'Democracy and Monarchy in France' (1872); 'Christopher Columbus' (1892); compiled 'British Orations' (1884); and wrote much magazine and review matter.

ADAMS, Ephraim Douglass, American educator: b. Decorah, Iowa, 18 Dec. 1865. After graduating from the University of Michigan he took a post-graduate course in the same institution, receiving his degree of Ph.D. in 1890. He was immediately appointed special agent in charge of street railways for the 11th census. In 1891 he became assistant professor of history and sociology at the University of Kansas and in 1899 he was promoted to the chair of European history. In 1902 he was appointed associate professor of history in Leland Stanford University, becoming full professor four years later. His books are: 'The Control of the Purse of the United States Government' (1894); 'The Influence of Grenville on Pitt's Foreign Policy' (1904); 'British Interests and Activities in Texas' (Albert Shaw Lectures, Johns Hopkins University 1910); 'Power of Ideals in American History' (Dodge Lectures on Citizenship, Yale University, 1913).

ADAMS, Frank Dawson, geologist: b. Montreal, Canada, 17 Sept. 1859; he was graduated at McGill University in 1878; took advanced courses at Sheffield Scientific School (Yale), and at Heidelberg, applying himself particularly to lithology and physical geology; in 1889 became lecturer on geology at McGill, in 1893 succeeded Sir William Dawson as Logan professor of geology there; and in 1908 was appointed dean of the faculty of applied science.

ADAMS, Franklin Pierce, American humorist: b. Chicago, 15 Nov. 1881. He was educated at the Armour Institute and the University of Michigan. On graduating, in 1903, he entered newspaper work, which he followed for two years, on the Chicago *Journal*, after which he went to New York and became a member of the staff of the *Evening Mail*. For this paper he wrote a daily column under the caption "Always in Good Humor." His "Diary of our own Samuel Pepys" was another daily contribution which attracted popular attention. Besides his prose he has written much humorous verse. His works in book form are 'Tobogganing on Parnassus' (1911); 'In Other Words' (1912). Collaborated with O. Henry in writing 'Lo' (musical comedy, 1909).

ADAMS, Frederick Upham, American author and inventor: b. Boston, Mass., 10 Dec. 1859. While still a child his parents removed to Elgin, Ill., where he attended the public schools. From 1882 until 1890 he was engaged in the profession of mechanical engineering, and it was during this period that he invented an electric lamppost, which has since been universally adopted, and an electric light tower. In 1894 he was appointed chief smoke inspector for Chicago, which position he held for three years. In 1900 he constructed an experimental passenger train for the Baltimore & Ohio Railroad which broke all previous speed records. He was the founder of a periodical entitled *The New Time*, dealing with social problems and which he edited from 1896 until 1898. Besides his works on technical subjects, he has also written several novels. The most important of these publications are: 'Atmospheric Resistance and Its Relation to the Speed of Railway Trains' (1893); 'President John Smith' (1896); 'The Kidnapped Millionaires' (1901); 'John Burt' (1903); 'How Cities are Governed in Great Britain' (1904); 'John Henry Smith' (1905); 'The Bottom of the Well' (1905); 'The Revolt' (1907); 'The Vegetarians' (a comedy, 1911); 'Ramley' (a drama, 1911).

ADAMS, George Burton, American historical writer: b. Fairfield, Vt., 3 June 1851. He became professor of history at Yale University and beside editing various historical works is the author of 'Civilization During the Middle Ages,' 'The Growth of the French Nation,' 'European History,' Vol. II in Hunt and Poole's 'Political History of England,' 'The Origin of the Constitution.'

ADAMS, Henry, American historian, son of Charles Francis: b. Boston, 16 Feb. 1838. He was private secretary to his father during the latter's English ministry, and assistant professor of history at Harvard 1870–77, being reputed one of the most stimulating and original instructors as well as brilliant expositors in the country. With several pupils he published in 1876 'Essays on Anglo-Saxon Law,' of which he wrote on 'Anglo-Saxon Courts of Law.' In 1871 he collaborated with his brother, Charles Francis, in 'Chapters of Erie.' He edited the *North American Review*, 1875–76. In 1879 he published Albert Gallatin's writings (3 vols.); in 1882 a life of John Randolph (American Statesmen Series). But his life-work, and with one exception the foremost historical work of America in matter and style, is his 'History of the United States from 1801 to 1817' covering the presidencies of Jefferson and Madison (9 vols., 1889–91), in motive it is a defense of his grandfather, John Quincy Adams, for deserting the Federalist party; in essence, a history of the causes and conduct of the War of 1812. For this task he took up his residence in Washington and spent years ransacking its archives. He also lived for long periods abroad, examining various European records, and trained himself thoroughly in military and naval science and construction, besides studying historical and economic problems. Besides the works named he is author of 'Mont Saint Michel and Chartres' (1904); 'Letter to American Teachers of History' (1910); Life of George Cabot Lodge' (1911).

ADAMS, Henry Carter, American economist: b: Davenport, Iowa, 31 Dec. 1852. He was graduated from Iowa College; took a post-graduate course at Johns Hopkins University, where he became fellow and lecturer. He subsequently became professor of political economy in the University of Michigan and later represented the Interstate Commerce Commis-

sion in the standardization of accounting records for the government railways in China. He went to China for that purpose in 1913 and while there assisted in organizing the ministry of communication, statistics and accounts. He returned in March 1916.

ADAMS, Henry Cullen, United States Congressman from Wisconsin: b. Verona, N. Y., 28 Nov. 1850; d. 1906. His parents removed to Wisconsin while he was still a child. He began life as a farmer, then went into politics and filled various public offices, notably that of dairy and food commissioner, from 1895 to 1902. He was elected to Congress in 1903, where he remained until his death. He was the author of the Adams Act of 1906, under which the State experiment stations receive $720,000 annually for original research in agriculture. He took a prominent part in the Drug and Food Act of 1906 and in the organization of the meat inspection that followed.

ADAMS, Herbert, American sculptor: b. West Concord, Vt., 28 Jan. 1856. After early studies at the Institute of Technology, Worcester, Mass., and at the Normal Art School, Boston, he proceeded to Paris, and became a pupil of Antonin Mercier, 1885 to 1890. From 1890–98 he was instructor in the art school of the Pratt Institute, Brooklyn. In 1899 he was elected to the National Academy of Design and in 1906 vice-president. Among his distinctive works are tinted marbles and polychrome busts, notably that of "St. Agnes," of "Primavera" and of "A Young Lady" in pink marble, in the Metropolitan Museum, New York. His portrait busts of women are remarkably beautiful, among the best examples being that of Miss A. V. Pond (who afterward became his wife), completed in Paris in 1887, and one of Miss Julia Marlowe, the actress. In the Congressional Library, Washington, are a statue of Professor Channing and two bronze doors, begun by Olin Warner. A "Madonna with Angels" in marble, and the Vanderbilt bronze doors are in St. Bartholomew's Church, New York. His other works of importance are the bronze Jonathan Edwards Memorial at Northampton, Mass., bronze statues of Richard Smith, in Philadelphia, and William Ellery Channing, in Boston, and William Cullen Bryant, in New York. Adams' works were exhibited at the Chicago Fair of 1893 and at the Louisiana Purchase Exposition, St. Louis, in 1904, in both of which he received high awards. While modern and original, Adams, of all Americans, approaches closest to the Early Renaissance in his refined realism and in his great technical skill in marble cutting. Consult Taft, Lorado, 'History of American Sculpture' (New York 1904).

ADAMS, Herbert Baxter, American historical student and educator: b. Shutesbury, Mass., 16 April 1850; d. 1901. He was graduated at Amherst in 1872; took Ph.D. at Heidelberg; and on the opening of Johns Hopkins in 1876 was made fellow in history, 1878 associate in history, 1883 associate professor in history, and in 1891, full professor. In 1901 he resigned on account of ill health, and died shortly after. In 1884 he was a leader in organizing the American Historical Association, and was secretary till 1900, then becoming first vice-president. He edited the 'John Hopkins Studies in History and Political Science' from the start, also the 'Contributions to American Educational History' published by the United States Bureau of Education. His chief publication is 'The Life and Writings of Jared Sparks' (2 vols., 1893). Among his historical monographs are the 'The College of William and Mary,' 'Thomas Jefferson and the University of Virginia,' 'The Germanic Origin of New England Towns,' and 'Maryland's Influence in Founding a National Commonwealth.' But his best work was not in writing history, but in training others to write it, and he was a powerful influence in creating the new school of historical research.

ADAMS, John, American statesman, 2d President of the United States: b. Braintree, Mass., of a line of farmers, 19 Oct. 1735; d. 4 July 1826, the year after his son was inaugurated President. Graduated at Harvard, he taught school, and read theology for a Church career; but seeing his unfitness for it studied law and began practice in 1758, soon becoming a leader at the bar and in public life. In 1764 he married his famous wife. All through the germinal years of the Revolution he was one of the foremost patriots, steadily opposing any abandonment or compromise of essential rights; and in 1766 published essays in the Boston *Gazette,* reprinted in London 1768, entitled 'A Dissertation on Canon and Feudal Law,' really on colonial rights. In 1765 also he was counsel for Boston, with Otis and Gridley, to support the town's memorial against the Stamp Act. In 1766 he was a selectman, or in other words one of the three official rulers of the head of the New England colonies. In 1768 the royal government offered him the post of advocate-general in the Court of Admiralty,—in fact a lucrative bribe to desert the opposition; but he refused it. Yet in 1770, as a matter of high professional duty, he took his future in his hands to become counsel (successfully) for the British soldiers on trial for the "Boston Massacre." Though there was a present uproar of abuse, Mr. Adams was shortly after elected Representative to the General Court by more than three to one. In March 1774 he was contemplating writing the 'History of the Contest between Britain and America.' June 17 he presided over the meeting at Faneuil Hall to consider the Boston Port Bill, and at the same hour was elected delegate to the first Congress at Philadelphia (1 September), by the Provincial Assembly held in defiance of the government. Returning home, he was made a member of the Provincial Congress, already organizing resistance to England. Just after Lexington he again journeyed to Philadelphia to the Congress of May 1775; where he did on his own motion, to the disgust of his associates and the reluctance even of the Southerners, one of the most important and decisive acts of the Revolution, —induced Congress to adopt the forces already gathered in New England as a national army and put George Washington at its head, thereby engaging the Southern colonies irrevocably in the war and securing the one man who could make it a success. In 1776 he was a chief agent in carrying the Declaration of Independence. He remained in Congress till November 1777, serving on the Committee on Foreign Relations and as chairman of the Board of War and Ordnance, very useful and laborious, but making

one dreadful mistake; he was largely responsible for the policy of ignoring the just rights and decent dignity of the military commanders, which lost the country some of its best officers and led ultimately to Arnold's treason. His reasons, exactly contrary to his wont, were sound abstract logic, but thorough practical ineptitude.

In December 1777 he was appointed commissioner to France to succeed Silas Deane. Dr. Franklin and Arthur Lee were there before him; and though he reformed a very bad state of affairs, he thought it absurd to keep three envoys at one court and induced Congress to abolish his office, returning in 1779. Chosen a delegate to the Massachusetts Constitutional Convention, he was called away from it to be sent again to France. There he remained as Franklin's colleague, detesting and distrusting him and the foreign minister Vergennes, embroiling himself with both, and earning a cordial return of his warmest dislike from both, till July 1780. He then went to Holland as volunteer minister, and in 1782 was formally recognized as from an independent nation. Meantime Vergennes intrigued energetically to have him recalled, and did succeed in tying his hands so that but for his contumacious stubbornness half the advantages of independence would have been lost, as Vergennes was employed to gain points for France and not for the United States. In the final negotiations for peace he persisted (against his instructions) in making the New England fisheries an ultimatum, and saved them. The wretched state of American affairs under the Confederation made it impossible to do his country any good abroad, and the vindictive feeling of the English made his life a purgatory, so that he was glad to come home in 1788.

In the first presidential election of that year, he was elected Vice-President on the ticket with Washington; and began a feud with Alexander Hamilton, the mighty leader of the Federalist party and a chief organizer of our executive machine, which is accredited with the premature overthrow of that party, and had momentous personal and literary results as well. As official head of the party he thought himself entitled to its real leadership as well; Hamilton would not and indeed could not surrender his position, for the lesser men looked to him for counsel and policy, and the rivalry never ended till Hamilton's death. In 1796 he was elected President against Jefferson by three electoral votes, one "scratch" vote each in Pennsylvania, Virginia and North Carolina, a virtual defeat as not likely to recur. His term is recognized as one of the ablest and most useful of our administrations; but its personal memoirs are most painful and scandalous. The members of the Cabinet — nearly all Hamiltonians — laid official secrets before Hamilton and took advice from him to thwart the President. They disliked Mr. Adams' overbearing ways and obtrusive vanity,— for modesty or a low sense of personal dignity were no parts of his character,— considered his policy destructive to the party and injurious to the country, and felt that loyalty to them involved and justified a disloyalty to him. Finally his best act brought on an explosion. The French Directory had provoked a war with this country, which the Hamiltonian section of the Federalist leaders and much of the rank and file hailed with delight, thinking it a service to the world to cripple France as then ruled; but when it showed signs of a better spirit, Mr. Adams, without consulting his Cabinet (who he knew would oppose it nearly or quite unanimously), nominated a commission to frame a treaty with France. He had the constitutional right to do so; but a storm of fury broke on him from the Hamiltonian leaders as little better than a traitor. He was renominated for President in 1800, but beaten by Jefferson, owing to the loss of New York despite heavy gain in Pennsylvania. The causes were natural and local, and while machine unity might have gained the upper-class party one more election it was bound soon to be swamped by popular growth; but as it never won another, each faction laid its death to the other, and American History is hot with the fires of this battle even yet.

His later years were spent at home, where he was always interested in public affairs and sometimes much too free in his comments on them; where he read immensely and wrote somewhat. He heartily approved his son's break with the Federalists (see ADAMS, JOHN QUINCY) on the Embargo (q.v.). He died on the same day as Jefferson, both on the 50th anniversary of the Declaration of Independence.

Mr. Adams' greatest usefulness and popularity sprang from the same cause that produced some of his worst blunders and misfortunes: a generous impulsiveness which made it impossible for him to hold his tongue at the wrong time and place for talking, his vehemence, self-confidence and impatience of obstruction. He was fervid, combative, opinionated and masterful; but he had trust, admiration and respect from the majority of his party at the worst of times, and history justifies it. Consult 'Works' by his grandson Charles Francis Adams; Parker, T., 'Historic Americans' (1910).

FORREST MORGAN,
Connecticut Historical Society.

ADAMS, John, American educator: b. Connecticut 1772; d. 1863. He was graduated at Yale in 1795, was a school teacher till 1810, and thence till 1833 principal of Phillips Academy, Andover, Mass., which he developed into repute throughout the country. He was teacher of Oliver Wendell Holmes, who, in the lines beginning "Grave is the Master's look," commemorates him in his poem 'The School-Boy,' read at the Phillips Academy centennial in 1878.

ADAMS, John, Confederate soldier: b. Tennessee 1825: d. 30 Nov. 1864. He was graduated at West Point in 1846; was brevetted first lieutenant for bravery at Santa Cruz de Rosales, 1848; promoted captain of dragoons, 1856; and resigned 1861 to join the Confederate army, in which he rose to the rank of brigadier-general. He was killed at the battle of Franklin, Tenn.

ADAMS, John, the name assumed by Alexander Smith, one of the mutineers of the Bounty. After intoxication and massacre had killed off all the mutineers but himself, he was shocked into a complete change of heart, and became sincerely pious and of upright life; he was the patriarch of the little native and half-caste group on Pitcairn's Island, taught a school and held worship there. It was nearly

JOHN ADAMS

Second President of the United States

20 years after the mutiny before his existence was known; and though technically liable to execution for the mutiny the English officials felt that his hardships, exile and repentance had atoned for the crime, and that it would be wrong to remove the head from the little settlement. He was left unmolested and died in 1829. See BLIGH, WILLIAM; PITCAIRN'S ISLAND.

ADAMS, John Coleman, American clergyman: b. Malden, Mass., 25 Oct. 1849. He was graduated from Tuft's College in 1870 and the Divinity School in 1872, and entered the ministry of the Universalist Church and has since served several churches of his denomination. He is author of 'The Fatherhood of God' (1888); 'Christian Types of Heroism' (1891); 'The Leisure of God' (1895); 'Nature Studies in the Berkshires' (1899); 'Life of William Hamilton Gibson' (1901); 'Hosea Ballou and the Gospel Renaissance' (1903); 'Honorable Youth' (1906); 'Short Studies in the Larger Faith' (1907).

ADAMS, John Couch, English astronomer: b. in Cornwall, 5 June 1819; d. 21 Jan. 1892. A precocious mathematician, he became senior wrangler at St. John's College, Cambridge, and mathematical tutor there. He discovered in 1845, by calculation of the perturbations of Uranus, that another planet must exist beyond it, and fixed its position within two degrees; but search for it not being made, Leverrier of Paris independently made the same discovery next year, and Galle of Berlin at once found the planet (see NEPTUNE). This mathematical discovery of Neptune is justly regarded as one of the greatest triumphs of science. To commemorate it the University of Cambridge founded in 1848 the Adams prize to be awarded biennially for the best essay in astronomy, pure mathematics or other branch of natural philosophy. In 1851 he became president of the Royal Astronomical Society; 1858–59 professor of mathematics at Aberdeen University; 1859–92 Lowndean professor of astronomy and geometry at Cambridge, and in 1861 director of Cambridge Observatory. He was a delegate to the International Prime Meridian Conference at Washington 1884. He received the Copley medal of the Royal Society in 1848. His papers were edited by his brother, William G. Adams, and R. A. Sampson (2 vols., I, 1896; II, 1901).

ADAMS, John Quincy, American statesman, 6th President of the United States, son of John Adams: b. in Braintree, Mass., 11 July 1767; d. Washington, D. C., 23 Feb. 1848. At 10 he accompanied his father on his first embassy to France, and was placed at school near Paris. He returned with his father in about 18 months; but soon went back with him to Europe, and attended school in Holland and at the University of Leyden. At 15 Francis Dana, his father's secretary of legation, who had been appointed minister to Russia, took him with him as his private secretary. After 14 months' stay in Russia, where Catherine refused to recognize Mr. Dana, he traveled back alone through Sweden and Denmark to The Hague. Soon after his father's appointment as ambassador at London in 1785, he returned home to complete his studies, as he believed "an American education to be the best for an American career," a coolly judicious choice for a lad of 18. He was graduated at Harvard in 1788, entered the office of Theophilus Parsons (q.v.), and in 1791 was admitted to the bar. He now began to take an active interest in politics. He wrote a series of letters to the Boston *Sentinel* under the signature of "Publicola," in reply to Paine's 'Rights of Man,' and in 1793 defended Washington's policy of neutrality under the signature of "Marcellus." These letters attracted attention, and in 1794 Washington appointed him minister to The Hague. In 1798 he received a commission to negotiate a treaty of commerce with Sweden; and traveling through Silesia wrote an account of it which was published in London, and later translated into German and French. On Jefferson's accession to the presidency he was recalled and resumed law practice.

In 1802 he was sent to the State Senate; the next year to the United States Senate in place of Timothy Pickering, leading Hamiltonian. But the Hamilton-Adams feud (see ADAMS, JOHN) had split the party into rancorously hostile halves, and Mr. Adams was practically "boycotted" by the dominant section of his own party, as being an Adams, with an ingenuity of indecent insult curious to read of; still worse was it when Pickering was made his colleague by the other faction at the next vacancy. It was good training for the great career of his later life; he was not the man to conciliate his foes, and soon made the breach irreparable by breaking away from the party policy. Through life any action which strengthened the United States, or increased its dignity in the eyes of the world, or simply "showed fight" for any purpose, met with his heartiest approval and warmest support, even though fathered by his worst enemies; and he first supported (with some reservations) Jefferson's Louisiana purchase,— precisely in the line of the former Federalist policy and the nature of the party, but now fought by them as Jefferson's,— and in 1807 took a far more radical step. The action of France and Great Britain in plundering American commerce for evading their mutual blockade laws, and of the latter in impressing American citizens under pretense of their being English runaways, had enraged the country, but it was helpless against both and felt not strong enough at the time to fight either; finally the outrage of the Leopard on the Chesapeake (see the latter name) roused the Republicans to fury, and even many of the Federalists. But the leaders of the latter sympathized with England's difficulties in the war with Napoleon, would do nothing to embarrass her and even defended the Leopard's action. Mr. Adams was as hot as any Republican; he tried to have the Boston Federalists hold a meeting and pledge the government their support in any measures to curb British insolence, and on their refusal attended a Republican meeting and was put on a committee to draft such resolutions. The Federalists were soon compelled by popular feeling to do likewise, and Mr. Adams also drafted resolutions there. At the extra session of Congress in October the Embargo on all American shipping was passed, to see if England could not be starved into better behavior; half ruining New England, most of

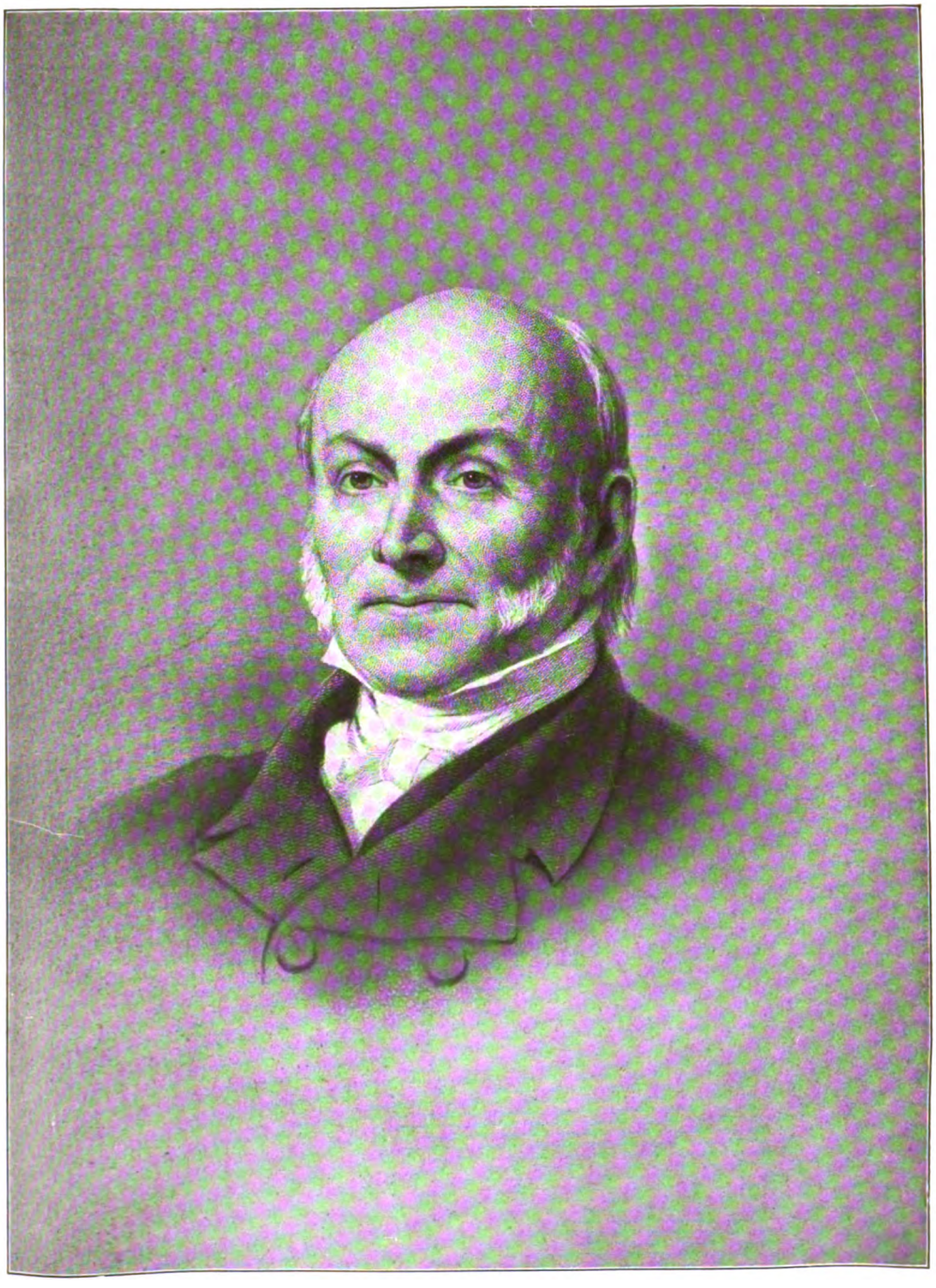
whose capital was invested in commerce, and injuring Americans much more than the enemy. Mr. Adams was a member of the committee which reported the bill, and earnestly advocated it,— not because it went as far as he liked, but as preferable to showing no resentment whatever, and all the Federalists would permit. The execrations leveled at his father for the French mission, and the charges of sectional and party treachery, were repeated on the son; political literature for half a century was glowing with the acrid polemics on the subject, and the prime object of his grandson Henry Adams's 'History' is to exculpate him. His term in the Senate was to expire 3 March 1809; in the preceding June the Massachusetts legislature elected James Lloyd to succeed him, as an insult, which he accepted and at once resigned. Meantime he had been made professor of rhetoric at Harvard and delivered lectures there. The next month he declined a Republican nomination to the House.

On Madison's accession in 1809 he at once appointed Mr. Adams minister to Russia; the Senate for some months refused to confirm the nomination, but at length yielded, and he passed four and one-half years there. In the peace negotiations with England over the War of 1812, he was a commissioner with Gallatin and Bayard, and again defeated assaults on the American fishing rights like his father. The treaty is usually considered a humiliating fiasco for America; but it is significant that the British press considered it a surrender on their side, and especially reviled Mr. Adams for his share in it. Visiting Paris, he was made commissioner to negotiate the American-English commercial treaty signed 13 July 1815. Meantime he had arrived in England, 26 May, and received the news of his appointment as minister to that country. The synchronism of wars, treaties and ministerships between father and son is so curious that in ancient history it would be treated as indubitable confusion of persons.

Eight years later, after leaving America, Mr. Adams was recalled to it as secretary of state under Monroe, inaugurated March 1817. His greatest achievement was the treaty with Spain ceding Florida to the United States for $5,000,000, to be used in paying American claims against Spain; and rectifying the boundaries of Louisiana and Mexico. His utter independence of personal against national considerations is singularly shown in his support of Jackson for invading Spanish Florida and hanging Arbuthnot and Ambrister; he hated and despised Jackson, who surely had violated all international law, but had roughly vindicated United States rights and put down dangerous intrigues with savages, and Mr. Adams vigorously defended him. Adams was the author of the "Monroe Doctrine," and though he never dreamed of its later interpretations would not improbably have sympathized with them. He also drew up a report on weights and measures which is still a classic, and shows an almost incredible amount of investigation. An ultimately far more important question came up over the admission of Missouri as a slave State. The Missouri Compromise (q.v.) had been passed and put before Monroe for signature, but he submitted to his Cabinet the questions whether Congress had a constitutional right to prohibit slavery in a Territory, and whether the prohibition of slavery "forever" in the territory north of Mason and Dixon's Line meant while it remained a Territory or thereafter. The Cabinet was unanimous in the affirmative on the first question; Mr. Adams was alone in declaring that "forever" included statehood also.

In the presidential election of 1824 there was no electoral majority: Andrew Jackson had 99, Mr. Adams 84 (a remarkable vote considering his ungracious manner, gift for making enemies and refusal to do anything to promote his election), William H. Crawford 41 and Henry Clay 34. Crawford was put out of the field by a paralytic stroke. As Clay could not be elected, his supporters cast their votes for Adams as preferable to Jackson: the former represented the same public policy as theirs, he was the ablest public official in the country and not personally hostile to Clay, while Jackson was regarded as an ignorant and violent demagogue. Mr. Adams was elected, and made Clay secretary of state, a place to which Clay's talents and position gave him almost a prescriptive claim. The Jacksonians denounced this as a corrupt bargain to defeat the people's will, and absurdly gave it the name of the unsavory English "Coalition," a catchword which was an efficient party weapon for many years. Mr. Adams' administration had no dramatic events. Its policy was based on a new division of parties. The Federalists were dead, consequently their opponents were dead also, and the new division was into National Republicans, afterward Whigs, and Democratic-Republicans, or Democrats; the former favoring internal improvements, a national bank and high tariffs, the latter opposing them. In reality, the division was between the preferences of the capitalist class and the masses; and the vast overplus of the latter in the South, now concentrated on Jackson instead of a threefold split (they had given almost none to Adams), carried him in four years later by 178 to 83. Much is always made of the hostility of the northern commercial classes whose trade the tariff was intended to cut down, of the southern planters who would lose as consumers while having nothing to protect as producers, and the Jacksonian bribe and threat of "spoils"; but by the figures they cost Adams nothing.

Mr. Adams retired, as he supposed, from public life. But in 1831 the constituency of his district around Braintree elected him a member of Congress on the Anti-Masonic ticket (see ANTI-MASONRY; MORGAN, WILLIAM); and though that party soon died, his immense ability and unique power in Congress kept him there till his death. By a singular fortune, he owes by far his greatest fame to this relatively small position after his crowning office was laid down. Belonging to no party, a political Ishmaelite, of the loftiest patriotism and the highest integrity, but scornful of nature and irritable in temper, rousing every demon of hatred in his fellow-members, in constant and envenomed battle with them and more than a match for them all, the "old man eloquent" was for many years a storm centre of wonderful picturesqueness. But his repute is not a mere political curio: he had the fortune to



JOHN QUINCY ADAMS

Sixth President of the United States

take his place at the very outset of the struggle of the slave oligarchy to suppress free speech and writing on the slavery question, and crush political liberty to uphold slavery. He fought the attempt unflinchingly year after year by purely legal methods, upholding the right of petition as indefeasible under any government or for any purpose,—he did not hesitate to submit a petition from Virginians praying for his own expulsion as a nuisance,—and consequently a right of slaves or of others in their interest; and with little sympathy for the anti-slavery cause as such, became by force of circumstances its mightiest champion. He died of a stroke of apoplexy on the floor of the House. Consult 'Writings of John Quincy Adams,' edited by W. C. Ford (New York 1917).

FORREST MORGAN,
Secretary Connecticut Historical Society.

ADAMS, John Quincy (2d), American politician, son of Charles Francis: b. in Boston, 22 Sept. 1833; d. 14 Aug. 1894. He was graduated at Harvard in 1853, and became a lawyer. A Democrat after the war, he took hopeless candidacies for the governorship to keep the organization together, in 1867 and 1871, and for the vice-presidency in 1872. He also served in the legislature in 1866, 1869 and 1870. In 1877 he was made a member of the corporation of Harvard.

ADAMS, Maud Kiskadden, American actress: b. Salt Lake City, 11 Nov. 1872. She is the daughter of an actress, who, under the stage name of Adams, was leading woman of a stock company in that city. Her first appearance was made while a child on a stage in the West; she then continued to take children's parts till she reached the age of 16 when she left Daniel Frohman's company to take an important rôle in Hoyt's 'A Midnight Bell.' She later became a member of Charles Frohman's stock company; in 1892 supported John Drew in 'The Masked Ball'; and in 1898 scored a marked success as Lady Babbie in J. M. Barrie's 'Little Minister.' In 1899 she played Juliet in 'Romeo and Juliet'; in the season of 1900–01, won further approval as the Duc de Reichstadt in Rostand's 'L'Aiglon'; in 1901–02 took the character of Miss Phoebe in Barrie's 'Quality Street'; in 1903–04 played 'The Pretty Sister of José'; and in 1905–07 Barrie's 'Peter Pan.' She has appeared in such Shakespearean rôles as Viola and Rosalind and assumed the title rôle in Rostand's 'Chanticleer' in 1911. In 1913–14 she starred in Barrie's 'Legend of Leonora.' Consult Clapp and Edgett, 'Players of the Present,' in the Dunlap Society Publications (New York 1899).

ADAMS, Nehemiah, American Congregational clergyman: b. Salem, Mass., 19 Feb. 1806; d. 6 Oct. 1878. He was graduated at Harvard in 1826, and at Andover Theological Seminary in 1829. The same year he settled at Cambridge, but 1834–70 was pastor of the Essex Street Church in Boston, and was widely reputed for his eloquence and learning. He published several polemic works; a great sensation and much hostile criticism were created by 'A South Side View of Slavery,' published in 1854 after a winter in Georgia, in which he lauded slavery as beneficial to the negroes' religious character. He published also a 'Life of John Eliot.'

ADAMS, Samuel, American patriot: b. Boston, 27 Sept. 1722; d. 2 Oct. 1803. He was son of a rich merchant, ship-owner and magistrate, a leader in provincial contests with royal governors, and inventor of the caucus in fact and perhaps unintentionally in name. Educated at the Boston Latin School, he was graduated at Harvard in 1740. In 1743 he wrote for his master's degree a thesis upholding the lawfulness of resisting supreme magistrates. He became a lawyer; but the profession was under ban with the upper classes, and at his family's wish he entered a leading merchant's counting-house. Shortly afterward his father set him up in business, in which he lost half his capital, losing the other half by a loan never repaid. Then he became partner with his father in a rather unsuccessful brewery. Soon the father lost nearly all his property in a land-bank scheme crushed by an act of Parliament, which extended an English banking enactment to the colonies. The hundreds of ruined shareholders denounced this act as an invasion of chartered colonial rights, and it turned the cream of the business leaders of Massachusetts, and their sons and daughters, into potential rebels at a blow. On his father's death in 1748 he carried on the brewery alone, and was nicknamed by his opponents «Sammy the maltster,» changed to «Sammy the publican» when he was made tax-collector of Boston 1763–65. Meanwhile he had become a great power in town meetings, having strong and sincere democratic feeling and a marvelous genius for political management and «caucusing.» As collector he was a bad business manager and was sharply assailed; but his political headship is shown by his being selected in 1764 to draft the town's instructions to its representatives relative to the Stamp Act,—the first public American protest against the parliamentary right of taxation,—and the like instructions the next year. He was himself in the legislature 1765–74, being clerk of the House and on the leading committees, drawing up the most important state papers of that stormy time, and spokesman as well as prompter of the incessant wrangles with Governors Bernard and Hutchinson. When the Townshend Acts were passed in 1767, he drafted the legislature's petition to the King, the instructions to the Massachusetts agent in England, and the circular letter of February 1768 to the other colonies asking their aid. The latter led directly to the Revolution, George III ordering Bernard to command the legislature to rescind it or be instantly dissolved. The latter refusing by 92 to 17, the King thereon resolved to send troops to overawe the colony. The same year Adams wrote 'The True Sentiments of America,' and in 1769 a famous 'Appeal to the World.' The morning after the «Boston Massacre» he was made chairman of a committee to communicate to Governor Hutchinson and his council the town-meeting vote that the two regiments of British soldiers should be removed to the castle in the harbor. When the governor wished to compromise on one, Adams had the people insist on «both or none,» and both were removed, thereafter being known in Parliament as the «Sam Adams regiments.»

In 1772 the order was issued that the judges should thereafter be paid by the Crown, not by the colony, and be removable at the King's pleasure; the Boston town-meeting requested Governor Hutchinson to convene the legislature on the question, and on his refusal Mr. Adams revived a proposal of Jonathan Mayhew's in 1765, to have the towns of Massachusetts appoint committees of correspondence to consult about the common weal. Eighty towns soon adopted the suggestion, forming an omnipotent revolutionary legislature beyond the reach of government veto or dissolution, yet quite within the law. The next spring intercolonial committees of the same sort were formed,—an unorganized government of the united colonies. Meanwhile Mr. Adams had kept the public spirit inflamed and alive to the nature of the crisis by articles under various pseudonyms in the Boston *Gazette*, arguing the colonists' legal rights and the practical impossibility of any compromise; thus not only preparing the public for the crisis and bringing over the waverers, but making the crisis itself more inevitable. The management of the tea-ship matter was in the hands of the committees of correspondence of Boston and five adjoining towns, of which Mr. Adams was the active head; and the throwing of the tea into the harbor, 17 Dec. 1773, was unquestionably supervised or arranged by him. When as a punishment the port of Boston was closed and the charter of Massachusetts annulled in April 1774, and the legislature met at Salem under parliamentary order to abase itself and undo its bad work, Mr. Adams locked the door, pocketed the key and carried through the measures for calling a congress at Philadelphia in September; the legislature adjourned *sine die* while the governor's clerk was hammering at the door with the writ of dissolution, and British authority was at an end. Mr. Adams' lifework—of assuring the breakdown of a system difficult to work at best, the government of a country by scornful aliens plus the aristocratic native families—was over. Though a useful and upright public servant, he was of secondary importance in presence of large problems of constructive statesmanship; his abilities were parochial, and he does not figure on a national scale. He could manage caucuses and organize jealousies, but hardly frame constitutions. At the Philadelphia Congress he was of course a delegate, and greatly smoothed over sectional distrusts by his shrewdness, tact and geniality. In 1775 he and Hancock were the only patriots excepted from amnesty; and it was Gage's attempt to seize them—under government orders, and with London forecasts that their heads would soon adorn Temple Bar—that brought on the battle of Lexington and opened the Revolutionary war. They escaped by Paul Revere's warning. He led in pushing forward the Declaration of Independence, of which he was one of the signers; and was active in Congressional work till the close of the Revolution. With much creditable service, his sympathies were always with division of authority; he believed in committees instead of executive heads, and national policy was often affected disastrously by the delays and irresponsibility involved. He was largely instrumental in framing the State Constitution of 1780. Nationally, he was of course an Anti-Federalist, opposing a strong national government in fear of tyranny; after long hesitancy over supporting the Constitution of 1787, he did so only on the understanding that amendments constituting a bill of rights should be submitted; but his voice in favor of ratification by Massachusetts secured it by 187 to 168, and saved it to the nation. He was long on the Executive Council of Massachusetts, lieutenant-governor 1789–94, and governor 1794–97 (three terms).

ADAMS, Samuel Hopkins, b. Dunkirk, N. Y., 26 Jan. 1871. He was graduated from Hamilton College in 1891 and spent the next nine years as reporter and special writer on the New York *Sun*. He was managing editor of McClure's Syndicate 1900–01; advertising manager of McClure, Phillips & Co., 1901–02; and a member of the staff of *McClure's Magazine* 1903–05. He contributed a noteworthy exposure of quack medicines in a series of articles to *Collier's Weekly* in 1906, which resulted in the correction of many of the abuses described and the closing down of several patent medicine factories. He has written 'The Great American Fraud' (1906); 'The Mystery' (with Stewart Edward White, 1905); 'The Flying Death' (1906); 'Average Jones' (1911); 'The Secret of Lonesome Cove' (1913); 'The Clarion' (1914); 'Little Miss Grouch' (1915); 'Our Square and the People in It' (1917).

ADAMS, Suzanne, American soprano singer: b. Cambridge, Mass., 28 Nov. 1873. After studying with Marchesi in Paris she made her début at the Paris Opera in 1894 as Juliette in Gounod's 'Romeo et Juliette.' After three years in Parisian opera she went to Nice. In 1898 she appeared at Covent Garden, London, and during the season of 1898–99 she appeared at the Metropolitan Opera House in New York. In 1898 she married Leo Stern, the violoncellist, who died in 1904. Her rôles include Juliette, Marguerite, Gilda, the Queen in 'Les Huguenots,' Queen of the Night in 'The Magic Flute,' Mimi and Micaela.

ADAMS, Thomas, English clergyman and author: d. 1655. From 1612 to 1614, he preached at Willington Bedforshire, where he published 'Heaven and Earth Reconciled,' and 'The Devil's Banquet.' These were followed by a great number of other works, admired for their diversified brilliance, and by 'occasional' sermons which place him in the front rank of contemporary English preachers. His works are said to have influenced John Bunyan; while he is compared to Jeremy Taylor in brilliance of fancies, to Thomas Fuller in wit, and Southey styles him «the prose Shakespeare of Puritan theologians.» In 1618 he was attached to St. Paul's Cathedral and became «observant chaplain» to Sir Henry Montague, lord chief justice of England. His writings edited by J. Angus and T. Smith were published in J. P. Nichol's 'Puritan Divines' (3 vols., London 1862).

ADAMS, Thomas Sewall, American economist and educator: b. Baltimore, Md., 29 Dec. 1873. Having graduated from the Baltimore City College in 1893, he entered Johns Hopkins University and there obtained his degree of Ph.D. For a year he filled an

appointment as a clerk in the Census Bureau in Washington; he became assistant treasurer of Porto Rico. In 1901 he was appointed associate professor of political economy at the University of Wisconsin, being promoted to a full professorship in 1908. In 1910 he became professor of political economy in Washington University, where he remained a year, then resumed his former position at the University of Wisconsin. In 1911 he became tax commissioner of Wisconsin. His works include: 'Taxation in Maryland' (1900); 'Labor Problems' (in collaboration with Helen L. Sumner 1905); 'Mortgage Taxation in Wisconsin and Neighboring States' (1907); 'Outlines of Economics' (with R. T. Ely 1908).

ADAMS, Walter Sydney, American astronomer: b. Antioch, Turkey, 20 Dec. 1876. He was graduated from Dartmouth College in 1898, and took post-graduate courses in the University of Chicago and at Munich. In 1901 he was appointed assistant in the Yerkes Observatory. Three years later he was made assistant astronomer at the Mt. Wilson Solar Observatory. During 1910 and 1911 he was acting director of this observatory. Beside numerous articles on astronomical subjects he has published 'Investigation of the Rotation Period of the Sun by Spectroscopic Methods' (1911).

ADAMS, William, the first Englishman in Japan: b. Kent, c. 1575; d. 10 May 1620. In 1598 he sailed as pilot of five Dutch vessels from the Texel to the East; landing at Kiushiu. The great Shogun Iyéyasu, who shortly before crushed his rivals and ended Japan's feudal anarchy, first imprisoned and then took him into service, employing him in shipbuilding, as informant, etc. Iyéyasu dying in 1616, a reaction against foreigners set in, and Adams wished to return to England, where he had left a wife and children; but was forbidden, and married a Japanese wife, their descendants still living in Japan.

ADAMS, William Taylor, American author and editor, best known by the pseudonym "Oliver Optic": b. Medway, Mass., 30 July 1822; d. 27 March 1897. He taught for many years in the Boston schools. He was a voluminous and highly popular writer of fiction for young readers, his works including over 100 volumes, mainly travel and adventure: 'Young America Abroad,' 'Starry Flag Series,' and others.

ADAMS FAMILY, of Massachusetts. In the varied abilities and conspicuous public importance of its members, this family confessedly outranks every other in the United States. It has furnished in a single line two Presidents, both of great weight and permanent importance, and even more interesting as virile and individual characters, provoking admiration or hate, but never indifference; a statesman and a diplomat of high order; the author of one of the two first-rate histories yet written in America, matter and style both considered; a noted financier and business magnate, and prominent author as well; another keen and vigorous writer; and an able lawyer and local politician who might have attained larger importance but for belonging to a party in a hopeless minority in his State. The founder in America was Henry Adams, an Englishman with eight sons, who removed to Braintree, Mass., in 1636; but the fortunes of the family began when to this tough stock — in the person of John Adams, who died in 1760, a selectman of Braintree and a deacon, and a farmer almost a rich man for the times — was added the energetic, passionate Boylston blood, a strain commemorated in Boylston Street, Boston, and the town of Boylston, Mass. The son of John Adams and Susanna Boylston was President John Adams (q.v.), the real founder of the family greatness and its striking individuality. All its members since have been distinguished by the same general qualities in varying mixture. They have mostly been vehement, proud, pugnacious and independent, with hot tempers and strong wills; but with high ideals, dramatic devotion to duty and the intense democratic sentiment so often found united with personal aristocracy of feeling. They have been men of affairs first, with large practical ability, but with a deep strain of the man of letters which in this generation has outshone the other faculties; strong-headed and hard-working students, with powerful memories and fluent gifts of expression. But no curio of heredity in all time is stranger than the contrast between the President father and his President son, John Quincy Adams (q.v.), when it is remembered that to the fiery, combative, bristling Adams-Boylston blood was added an equal strain from the gay, genial, affectionate Abigail Smith (see ADAMS, ABIGAIL). The son, though of deep inner affections, and even hungering for good will if it would come without his aid, was on the surface incomparably colder, harsher and thornier than his father, with all the socially repellent traits of the race and none of the softer ones. The father could never control his tongue or his temper, and not always his head; the son never lost the bridle of either, and much of his terrible power in debate came from his ability to make others lose theirs while perfectly keeping his own. The father had plenty of warm friends and allies — at the worst he worked with half a party; the son in the most superb part of his career had no friends, no allies, no party except the group of constituents who kept him in Congress. The father's self-confidence deepened in the son to a solitary and almost contemptuous gladiatorship against the entire government of the country through long years of hate and peril. The father's irritable though generous vanity changed in the son to an icy contempt or white-hot scorn of nearly all about him. The father's spasms of acrimonious judgment steadied in the son to a constant rancor always finding new objects. The country has reason to be thankful for his unamiable traits, for each one strengthened his fibre to do the work awaiting him, and only John Quincy Adams could have accomplished the work of John Quincy Adams. His son, Charles Francis Adams, Sr., had the useful and forcible qualities of both without their besetting defects. He was in youth as hotly pugnacious as his grandfather; he was always as self-centred as his father, and as willing to stand alone amid hate and incessant conflict; but he had far more self-control than the former, and far less bristling repellance and contempt of co-operation than the latter. His diplomacy was cast in a spot where he was too much "boycotted" to make the softer side of much avail; but he roused no useless and costly

hatreds, and ranked the peer in effectiveness of any European diplomat. Of his three sons (see CHARLES FRANCIS, 2d; HENRY; BROOKS) it would be invidious to analyze the personal traits. The former, soldier, railroad commissioner, president of the Union Pacific Railroad, and eminent historical scholar and publicist, has shown the family traits of courage, independence of thought and action, and intellectual energy, to the full, and is still an active public force. The historian was distinguished during his historical professorship as the most original, independent and stimulating of instructors; and his history displays not only massive research, enormous power of acquisition in the most widely separated fields, and entire freedom from beaten roads and traditional views, but tempered self-control, the moderation of judgment bred by thorough knowledge and a pervasive atmosphere of gentlemanly irony. The essayist assailant of the Massachusetts "theocracy," and student of economic history to saturation, was as eager and passionate as his great-grandfather, and in striking contrast with his brothers in literary style, but none the less a man to reckon with. The late John Quincy 2d would perhaps have filled a larger public field in a less strongly Republican community. It is not likely that this virile stock has lost its energy with the present generation.

This by no means, however, ends the contributions of the Adams stock to our public life. The patriot, Samuel Adams, the father of American liberty, was own cousin to John Adams the President; a more dexterous and politic man, and much abler political manager, but not otherwise cast in as large mold. From different sons or grandsons of the pioneer have descended William Taylor Adams ("Oliver Optic"), the well-known juvenile writer; Charles Baker Adams, the naturalist, and Edwin Adams, the actor, the grandfather of the first being the great-grandfather of the second; Herbert Baxter Adams, the eminent American historical scholar and educator; Alvin Adams, the founder of the Adams Express Company; William Claflin, the Massachusetts merchant and governor, whose mother was an Adams; and many other strong figures in public life. Consult Adams, A. N., 'Geological History of Henry Adams, of Braintree, and His Descendants' (1910).

ADAMS, Mass., town in Berkshire County, containing villages of Adams (formerly South Adams), Maple Grove, Zylonite and Renfrew; the first and chief 16 miles north of Pittsfield, 6 miles south of North Adams, which was set off in 1878; on Pittsfield & N. A. branch of the Boston & A. division of the New York Central Railroad. It is on Hoosac River, and contains Greylock Mountain, the highest point in Massachusetts. Founded in 1749 as East Hoosuck, it was renamed for Samuel Adams 1778. Its manufacturing industries, including paper, fabrics, foundry work, etc. (U. S. Census 1914), are carried on in 35 establishments and employ 4,047 persons of whom 3,930 are wage earners, receiving annually $1,793,000 in wages. The aggregate capital employed was $7,119,000. The annual value of the products amounts to $6,530,000. It has a public library and a town board of three selectmen, the government being administered by town meeting. Pop. (1910) 13,026; (1917) 14,000.

ADAM'S APPLE, *in botany,* (1) the name given by Gerard and other old authors to the plantain tree (*Musa paradisiaca,* from the notion that its fruit was that sinfully eaten by Adam in Eden. (2) The name given, for the same reason, to a species of *Citrus.*

In anatomy, a protuberance on the forepart of the throat, due to the thyroid cartilages. The name is supposed to have arisen from the absurd popular notion that a portion of the forbidden fruit, assumed to have been an apple, stuck in Adam's throat when he attempted to swallow it.

ADAM'S BRIDGE, or **RA-MA'S BRIDGE,** a chain of shoals across the Gulf of Manaar, between Hindustan and the island of Ceylon, in the Rāmāana fabled to have been constructed by monkeys.

ADAM'S PEAK, one of the highest mountains in the island of Ceylon, about 45 miles east of Colombo. It is of a conical shape, 7,420 feet high, and can be seen in clear weather from sea 150 miles away. From its solitary position and immense height above the surrounding country the peak forms a striking and awe-inspiring object and has been for centuries venerated by the inhabitants. On the top, under a sort of open pagoda, is the sacred footmark, a natural hollow in the rock, artificially enlarged, and bearing a rude resemblance to a human foot. Mohammedan tradition makes this the scene of Adam's penitence after his expulsion from Paradise; he stood 1,000 years on one foot weeping for his sin, hence the mark. To the Buddhists, the impression is the *Sri-pada,* or sacred footmark, left by Buddha on his departure from Ceylon; and the Hindus recognize Buddha as an avatar of Vishnu or Siva. Devotees of all creeds here meet and present their offerings (consisting chiefly of rhododendron flowers) to the sacred footprint, finishing their devotions by a draught from the sacred well. The ascent of the mountain is very steep, and toward the summit is assisted by steps cut and iron chains riveted in the rock, the last 40 feet being accomplished by an iron ladder. The top is an area of 64 feet by 45.

ADAMSON, Patrick, Scottish prelate (real name was spelled Constyne, Constean, Conston, Constant, and Constans; later changed to Constantine, then to Adamson): b. Perth, 15 March 1536; d. 19 Feb. 1592. He took his degree at St. Andrews, and in 1566 went to Paris as tutor. Here he wrote a Latin ode on the birth in June of James VI, and called him "king of France and England," for which the French court gave him six months' imprisonment. Released, he went to Padua, Geneva and Paris, and finally to Bourges, where he lay in hiding for seven months in fear of the rage against Protestants let loose by the massacre of St. Bartholomew (1572), and which cost his host's life. Recalled to Scotland (in 1573), he became a prominent minister, one of the commissioners to settle Church matters, and chaplain to the regent Morton, who in October 1576 made him archbishop of St. Andrews. The tragedy of his life lay in his attempting to be an old-fashioned prelate in the new Scotland which hated prelacy, and to air High-Church preferences before men who considered them

popery. He began the warfare himself by declaring that he would oppose all attempts to deprive the archbishopric of any of its former power; the presbytery took up the glove, and never ceased till they had pulled him down. He was assailed first for not having been consecrated to his post; making his peace somehow for this, they again attacked him for insolence to the presbytery, for opposing its interests in Parliament, for popery and heresy. The conflict grew so hot that he retired to the castle of St. Andrew's, where he was cured by a "wise woman" of a disease the doctors could not handle, and the presbytery afterward seized and burnt her for it. In 1583 he went to England as James' ambassador, exciting attention by his eloquence, and being savagely libeled by the Presbyterians for alleged looseness of behavior. Returning next May, he was high in favor with James, and his chief agent or prompter in severe measures against the Puritans. In December 1585 he published a paper on the "King's Majesty's Intent in the Late Acts of Parliament," which was a chief article in his derelictions then, but in 1646, in the heart of the Civil war, was reprinted by the Puritans as on their own side. In 1585 Andrew Melville and other Presbyterian leaders returned after the Raid of Ruthven (q.v.), and that party was gaining the upper hand: Morton had been executed in 1581. In April 1586 Adamson was impeached and excommunicated; the next year the excommunication was removed, but in 1588 he was freshly accused,—among other things, of mutilating and abstracting registries,—and the King, tired of the quarrel or convinced that it was Adamson's fault, transferred the revenues of his see to another party and left him in actual want for himself and family. A small pension was afterward granted him, but he died poor and wretched.

ADAMSON ACT. See ARBITRATION, INDUSTRIAL; LABOR LEGISLATION.

ADANA, ä'dą'ną, an ancient town in the southeast of Asia Minor, capital of Adana vilayet, on the Sihun, about 25 miles from its embouchure in the Mediterranean, and about 30 miles from its port Mersina, with which, and with Tarsus about half way between, it is connected by railway. Pop. about 45,000. Of vilayet, 422,400.

ADANSON, å-dåñ-sōñ, **Michel,** French naturalist and traveler (of Scottish extraction): b. 7 April 1727; d. 3 Aug. 1806. Although he gave much time and attention to the study of the sciences, particularly electricity, his chief work was in the realm of botany. From 1784 he spent five years in Senegal and collected a large number of plants and animals which he classified and described. His more important works are: 'Histoire Naturelle du Sénégal' and 'Familles des Plantes,' in which he opposed the system of Linnæus.

ADANSONIA. See BAOBAB.

ADAPTATION, the power and process of gradual change in an organism to fit it to its environment. See BIOLOGY; EVOLUTION.

Life came to be, it is inferred, when the gradually accumulated energy which resulting in physical and chemical forces forced a better medium for its interchange, which science, to-day, symbolizes under the term vitalism. This is then a sort of superchemistry which arose out of the need of handling the cosmical energy constantly being delivered to the earth's surface. One of the methods of interplay between the living matter and its environment is adaptation. This adaptation is never perfect save in those forms which become fixed and these are on the decline in structural differentiation. They cease to evolve to higher types, for evolution implies new conquests over the environment.

By the terms environment, surroundings, conditions of life, medium or *milieu,* or *monde ambiant,* is meant everything outside of the individual plant or animal, between which and the living matter there is an energy interchange. The nature of the earth's surface, of the soil, of well-watered regions, of deserts, plains or barrens, the physics of the air and sea, are taught in our textbooks of physical geography. Each such area is inhabited by assemblages of living beings adapted well or ill to such or such conditions. We speak of alpine or arctic life, of the flora and fauna of deserts, of mountains, of lowlands, of the great plains, of forests, of the coasts and abysses of the sea. The word "fauna" means the assemblage of animals inhabiting any area, as the word "flora" is used for the plants. Now each of these areas, with its peculiar surface features, climate, soil, etc., is characterized by a set of plants and animals which flourish better there than in adjoining regions, and hence are spoken of as being better adapted.

The most unique cases of adaptation to extreme conditions of life are seen in animals living in the darkness of caves, or in the dark abysses of the sea, or parasitic animals, as the fluke and tapeworm, the root-barnacles (*Sacculina*), the fish-louse (*Lernæa*) and many insects. In all these forms the body has, as the result of a parasitic life, undergone profound modification, becoming so atrophied in certain respects as to present the utmost contrast to their free-living allies. Adaptation is continually correlated with certain given conditions. If the conditions be changed, in time the organisms, unless they are modified and changed to what are called new species, become unadapted, unfit for the new environment and unsuccessful in the struggle for existence.

Extinct species are such unfit, unadapted forms. However well adapted they were at the period in which they lived, when the conditions of existence changed; when the climate changed from warm to cold, or the reverse; when the soil changed its elevation above the sea, or degree of dryness or humidity; when one area subsided; and another became elevated,—certain species or groups of species, unless they migrated, or were plastic enough to undergo modification and become what are called "new" species or "new" genera, unable to resist the change, died out,—became extinct. The harder parts of these extinct species are found in the rocks and are called "fossils." They are the relics of former worlds, witnesses of the profound changes in physical geography through which the earth has passed.

Extinction has not yet taken place for certain forms. A few ancient primitive forms have persisted and are still flourishing. Such

are many of the *Protozoa* (*Saccamina* and others), the *Lingulella* and *Lingula*, the king-crab (*Limulus*), the *Peripatus* and *Scolopendrella*, which are probably the ancestral forms of insects; among the fishes the Australian lung-fish (*Ceratodus*), and among lizards the *Hatteria* of New Zealand. These forms, for various reasons, have withstood the most widespread and the profoundest geological changes, but they are exceptional. On the other hand a vast number of species which were plastic enough to yield to the changes in their surroundings and became modified into new species became adapted to new conditions of existence. It is undoubtedly the case, then, that certain forms become maladapted and suffer extinction, though all through the ages the plant and animal census by no means became at any time lessened, but rather gradually increased in extent. Another fact clearly established is that the earlier forms were generalized and the later were specialized, and the former, the ancestors of the present species, had to make way for their more specialized descendants. Thus the trilobites were succeeded by the king-crabs, the creeping dinosaurs were succeeded by the flying reptiles or pterodactyls, and the highly generalized tailed *Amphibia* yielded the right of way to the tailless frogs and toads of the present day. Adaptation, then, is the process of modification of organisms caused by changes in the conditions of life. The most fascinating of all adaptive forms is man, who retains all of the characters which have been found most valuable for the utilization of more and more of the energy of the environment and who through structural specialization has fashioned organs of increasing efficiency to utilize these energy resources. The chief tool of adaptation of man is his use of symbols by means of his brain structures, which have given him increasing power to manage the vast amounts of energy which have been and are being subject to constant interchange.

ADAR, Jewish month, 12th of the ecclesiastical and 6th of the civil year; representing parts of February and March of ours. The 7th was a fast for the death of Moses, the 9th for the falling-out of Hillel and Shammai. But the important days were the 13th, a fast in commemoration of that of the Jews for their threatened destruction by Haman (see ESTHER), followed by a feast on the next two days for their escape.

ADARCE, a-där'sē, a salty deposit found on the grasses and sedges growing in wet places in ancient Galatia. It is used somewhat for cleansing the skin in cases of leprosy.

ADDA, ăd'dà (ancient Addua), a river of northern Italy, descending from the Rhætian Alps, falls into Lake Como, and leaving this joins the Po after a course of about 170 miles.

ADDAI, ăd'ăē, is said to have introduced Christianity into the principality of Edessa. The tradition is that he was one of the 70 disciples and was sent there by the Apostle Judas. The story comes from Syrian sources. 'The Doctrine of Addai, the Apostle' (now first edited in a complete form in the original Syriac with an English translation and notes by Phillips, London 1876), contains practically all that is known of him. The critics place the above-mentioned work at about the year 300. Bickell even placed its date in the 1st century. Some authors try to identify him with Thaddeus.

ADDAMS, Jane, American philanthropist: b. Cedarville, Ill., 6 Sept. 1860. Was graduated at Rockford College in 1881, and after post-graduate studies in Europe and the United States became an active social reformer. She inaugurated in 1889 at Chicago the establishment known as Hull House, an adaptation of the "social settlement" plan to Chicago conditions; acted as street-cleaning inspector in Chicago, and has lectured on the improvement of the condition of the poor in great cities; and on social and political reform. She has written 'Democracy and Social Ethics' (1902); 'Newer Ideals of Peace' (1907); 'The Spirit of Youth and the City Streets'; 'Twenty Years at Hull House' (1901); 'A New Conscience and an Ancient Evil' (1911). See SOCIAL SETTLEMENTS.

ADDAX, or **ADDAS** (Lat., of African origin), a North African antelope (*Addax nasomaculatus*), related to the oryx and similar to it in habits. Its large broad hoofs fit it for traveling over loose shifting sand; it has a long tail, long ears, and spirally-twisted horns three to four feet high. The animal measures about three feet in height at the shoulder; in color it is nearly white, with shading of reddish brown on the head and front of the body. The hoofs are black and there is a black, shaggy marking on the forehead above a white blaze on the nose. It is now becoming very rare in all parts of the Sahara. The Arabs hunt the addax with greyhounds.

ADDER (Anglo-Saxon *nædder*, Goth. *nadro*, Ger. *natter*, a snake), a colloquial name for several poisonous snakes, mostly belonging to the family *Viperidæ*, such as the copperhead, moccasin, asp, etc.; and also for certain harmless snakes of the family *Colubridæ*, particularly the spreading adder (*Heterodon platyrhinus*), which when angry resembles the poisonous snakes. (See HOGNOSE). In England the name denotes the only venomous snake of Great Britain,—the European viper (*Pelias berus*). See COPPERHEAD; DEATH-ADDER; PUFF-ADDER; VIPER; etc.

ADDICKS, John Edward, American capitalist: b. Philadelphia, 21 Nov. 1841. He acquired a large fortune as a gas manufacturer, organizing and becoming president of the Bay State Gas Company of Boston in 1884, and buying control of the Brooklyn (N. Y.) Gas Company in 1892. For 11 years he was of national prominence as candidate for the United States senatorship from Delaware, which he did not succeed in obtaining, but till 1906 was able to prevent the election of any rival, leaving both of Delaware's seats vacant. In 1895 his rival was H. A. Du Pont, and among the members of the legislature voting was the former speaker of the Senate, later governor through the death of Governor Marvel; the Democrats and Populists declared his vote illegal, and refused to seat Du Pont. In 1896 the Republican State Convention to elect delegates to the St. Louis National Convention split and elected two sets, Du Pont and Addicks; the former was recognized as "regu-

lar" by the St. Louis Committee on Credentials, while the other section called themselves Union Republicans. In 1899 a successor to Senator Gray was balloted for, but no election followed. In 1900 as in 1896 two sets of delegates went to Philadelphia, and this time the committee seated the Addicks party; though he was thus recognized as State party chief, the 1901 election for Senator was again a stalemate, and as there were two to elect, the State was left entirely unrepresented in the Senate. In the session of 1903 Addicks nominally withdrew, and the legislature elected two Senators, a Regular for the short term and a Union for the long term. On 12 June 1906 Du Pont was elected. Addicks's fortune was greatly impaired by his political course and was still further diminished by a court order in 1907 which obliged him to pay $890,000 of profits unlawfully drawn from the Bay State company.

ADDING-MACHINE. See CALCULATING-MACHINE.

ADDINGTON, Henry, VISCOUNT SIDMOUTH, English statesman: b. 30 May 1757; d. 15 Feb. 1844; educated at Winchester and Brasenose College, Oxford; he then studied law and, through the influence of Pitt, entered Parliament (1784); was speaker of the House of Commons (1789–1801); chancellor of the exchequer and first lord of the treasury; he put through a bill disqualifying clergymen from sitting in the House of Commons, and later, with Pitt's advice, negotiated (1802) the Peace of Amiens, a cessation of war much needed by England. In 1805 he was raised to the peerage. As home secretary (1812–22), he was strict in his administration of justice and in conservative oversight of the press and public meetings. Partly due to his too great zeal was the "Manchester massacre." He resigned in 1824, owing to his disapproving of the recognition of the independence of Buenos Ayres.

ADDIS ABEBA. See ADIS ABABA.

ADDISON, Daniel Dulany, American clergyman and author: b. Wheeling, W. Va., 11 March 1863. After graduating from Union College in 1883, he studied at the Episcopal Theological School, Cambridge, Mass., then became assistant rector of Christ Church, Springfield, Mass. In 1889 he was appointed rector of St. Peter's Church, Beverly, Mass., where he remained until 1895. He then became rector of All Saints Church, Brookline, Mass. He was especially interested in conditions in Liberia and was made a trustee of the College of Monrovia. In 1904 he was knighted by the government of Liberia for his services. He is the author of: 'Lucy Corcoran, Life, Letters and Diary' (1894); 'Phillips Brooks' (1894); 'Life and Times of Edward Bass' (1897); 'All Saints Church, Brookline' (1896); 'The Clergy in American Life and Letters' (1900); 'The Episcopalians' (1904).

ADDISON, Joseph, English essayist: b. Milston, near Amesbury, in Wiltshire, 1 May 1672; d. Holland House, London, 17 June 1719. Addison was the eldest son of the Rev. Launcelot Addison, a Royalist clergyman, who, after the Restoration, had been chaplain of the garrisons at Dunkirk and Tangier, and at the time of the birth of Joseph was rector of Milston. Later (1683) he was made dean of Lichfield. He was a man of character, attainment and considerable literary gift, which found its most interesting expression in 'Revolutions of the Kingdoms of Fez and Morocco,' a historical sketch of lively character. Addison's mother was Jane Gulston, daughter of Dr. Nathaniel Gulston and sister of William Gulston, bishop of Bristol. Addison was brought up in a pleasant country and in a family of admirable manners; his home life is described by Steele as delightful. He went to schools in the neighborhood and to the Charter House School, where he acquired some knowledge of Greek and a considerable familiarity with Latin literature.

In 1687 he entered Queen's College, Oxford, whence, after two years, he transferred to Magdalen. The change was the result of some excellent Latin verses, 'Inauguratio Regis Gulielmi,' in honor of King William, which attracted the admiration of Addison's preceptor and obtained for him a demyship. At Magdalen he lived a quiet, studious life, and his scholarly reputation is said to have extended itself to London. His academic career is chiefly connected with Magdalen; his M.A. came from that college in 1693; he was made probationary Fellow in 1697 and actual Fellow the following year; and a pleasant walk along the Cherwell to-day bears his name.

Addison's first published work was an 'Account of the Greatest English Poets' (1693), chiefly interesting, to-day because of the low plane which, following the taste of the times, he accorded to the great Elizabethans. Complimentary verses to Dryden (q.v.) the same year won for him the favor of the dictator. He next experimented with translation, rendering the fourth book of the 'Georgics,' two books of Herodotus, and the second book of Ovid's 'Metamorphoses.' This last task, though a distasteful one, had, according to Mr. Courthope, a marked effect on his taste in that it taught him to avoid extravagance of style. By this time he had made a fair name as a writer and had attracted the notice of the ministers, Charles Montague, afterward Lord Halifax, and Somers, who may have induced him to write a perfunctory 'Address to King William' (1695), and who probably persuaded him to enter civil rather than ecclesiastical life. At all events, Halifax and Somers obtained for him, in 1699, a pension of £300 a year for foreign travel. One of Addison's recommendations for this honor had been his 'Peace of Ryswick,' a Latin poem (1697), and various trifling contributions to the 'Musæ Anglicanæ' (1699). It was a critical year for Addison, in that his career was then determined.

Addison set out, in the summer of 1699, for France, where he remained a year and a half, chiefly at Blois, studying the language. From December 1700 to December 1701 he was touring in Italy, whence he went to Switzerland and, in the autumn of 1702, to Vienna. Thence he visited the Protestant cities of Germany, reaching Holland in the spring of 1703, and, in the fall, on receipt of news of the death of his father, returning to England. Some time previous to his return he had been deprived of his pension, for the death of King William, in 1702, led to the dismissal of Addison's patron, Halifax, and Addison was accord-

ingly out of employment. The literary result of his travels was a 'Letter from Italy' in verse, and his prose 'Remarks on Italy.' The latter is an interesting document in the history of English taste. Italy is interesting to Addison chiefly as the source of classical poetry, and his pleasure in it is almost wholly literary. His judgments, too, on the taste of the mediæval church builders are made from a narrow classical point of view. During the journey, Addison wrote his 'Dialogue on Medals' (1702) and the first four acts of 'Cato.'

In 1704, Addison, on the recommendation of Halifax, was asked by Godolphin to write a poem on Marlborough's victory at Blenheim, and accordingly, in that year, produced 'The Campaign,' a panegyric narrative in heroic couplets. The poem was of such aid to the Whig party that Addison at once gained preferment and was, in 1706, made under-secretary of state. His political duties did not keep him wholly from literature; in 1705 he helped Steele with 'The Tender Husband,' a drama, and on 2 April 1706 himself signally failed with the presentation of his opera 'Rosamond,' though it had some success when printed. On the loss of his political office in 1708, he was almost immediately made secretary to the Lord-Lieutenant of Ireland, Lord Wharton, and the same year sat in Parliament for Malmsbury, a position that he held till his death. From the Irish appointment dated his friendship with Swift (q.v.). The friendship of the two suffered some strain when, in 1710, at the fall of the Whig ministry, they found themselves arrayed on opposite sides in a bitter struggle for ascendency. Addison wrote five numbers of the *Whig Examiner* (up to 8 October) in opposition to the *Examiner* of the Tories, of which Swift took charge in November. Most of his offices Addison lost with the change of the ministry, and was free to pursue the course on which his fame rests.

Steele had issued the first number of the *Tatler* on 12 April 1709. It appeared three times a week and was first issued as a newspaper, with different classes of news — political, social, literary, etc., purporting to come from different quarters of London. The paper, however, was not long in losing these distinctions and soon became chiefly moral. For this change Addison, who entered at the 18th number and wrote 42 out of the total 271 numbers, may have been largely responsible. Coming to an end on 2 Jan. 1711, the *Tatler* was followed, on 1 March of the same year, by the *Spectator*, which, while modelled on the *Tatler*, was an improvement on it in all ways. It appeared daily, it was more essay-like in form, it was more varied in subject, more satirical in tone, and it addressed a wider range of readers, particularly women, in the belief that improvement in manners must begin with them. Since its place, as a form of literature, had been carefully prepared by the rise of the daily press, and, as an organ of education, by the growing reaction against the dissoluteness of Restoration manners and literature, it had marked success. Its circulation is estimated to have been 10,000 copies toward the close of its career, 6 Dec. 1712 (a continuation, issued thrice a week, came to an end in 1714), and the sale of completed volumes was equally great. Addison contributed 274 papers to 236 by Steele; Addison's are nearly all signed by one of the letters C. L. I. O.

On 13 April 1713, 'Cato' was acted. Though wholly different from the prevailing and the traditional English play in that it was built on severely classical and unromantic principles, and though succeeding generations have pronounced it to be a poem of noble sentiments rather than a dramatic play, it had great success and ran for 35 nights, an unprecedented period. This was largely due to the political situation,— the eve of the fall of Tory power and of Whig success,— and Addison was a man of such political eminence that his play was naturally to be regarded as of uncommon importance. Abroad, the play was well received. It was twice translated into Italian, twice into French and once into Latin, besides being often adapted. Voltaire praised it highly as a "regular tragedy," and regarded it as much superior to preceding English plays. Two years later Addison wrote 'The Drummer,' which was coldly received at Drury Lane.

In 1714, on the ascendency of the Whig party, Addison was made chief secretary to the Lord-Lieutenant of Ireland, the Duke of Shrewsbury, an office which he held till August 1715. From 23 December of that year till 9 June 1716, he wrote *The Freeholder*, a semi-weekly of 55 numbers altogether, designed to prove to the freemen of England the justice of the Whig cause and the need of the Protestant succession. In 1716, he was made a commissioner for trade and the colonies. This same year he married Charlotte, Countess Dowager of Warwick, to whom he is said to have been long attached. The marriage has been called unhappy and there is a fairly established tradition to that effect; in Pope's innuendo he "married discord with a noble wife." For the tradition there is, however, no good evidence. By her he had one daughter, Charlotte, who died unmarried, in 1797. His marriage was coincident with the height of his political career; in 1717 he was made secretary of state, an office which he resigned in March of the following year. His health was failing and he had never been a good public speaker.

The last half decade of his life was somewhat embittered by two famous literary quarrels. The first, with Pope, in 1715, was due, generally, to the fact that the two were essentially incompatible, and, in particular, to the fact that Pope felt aggrieved because Addison had praised warmly a rival translation of the 'Iliad' by Tickell, and even went so far as to suspect Addison of being the real author. Addison's acquaintance with Pope began with a favorable comment in the *Spectator* on the 'Essay on Criticism,' but thereafter he never spoke of Pope so highly as of the members of "his little senate." Addison may have advised Pope against adding to 'The Rape of the Lock' the brilliant and charming machinery of the fairies, and Pope is said to have tried to dissuade Addison from presenting 'Cato' on the stage, neither pieces of counsel likely to increase the mutual respect of the two authors. The result was that long after Addison's death Pope published, in his 'Epistle to Arbuthnot,' his famous satire on Addison, already written during the latter's life, and then defended his course by the publication of a somewhat doctored correspondence.

In 1719, Addison and Steele found themselves on opposite sides of a bill for definitively limiting the number of peers. Steele, though a Whig, opposed the party measure in a pamphlet called the *Plebeian* (14 March), and was answered by Addison five days later in the *Old Whig*. The contest ended in some personalities on Steele's part. Before a reconciliation could take place between the two life-long friends, Addison died of dropsy. He lies buried in Westminster Abbey.

By Addison's contemporaries and biographers he is almost always spoken of as a man of fine intellect, lofty character, considerate and distinguished manners and great personal charm. He has been called the chief architect of public opinion in the 18th century. His posthumous fame, of course, rests almost exclusively on his contributions to the *Tatler* and the *Spectator*, which contain nearly all that he had to say of permanent value. Their influence was directed, socially, to the bettering of contemporary life and manners and the inculcation of virtue, and, intellectually, to the improvement of the taste of his generation; of the former his mild satires on the affectations of his time are perhaps the best example, and, of the latter, there may be taken his somewhat formal but enlightening examination and criticism of 'Paradise Lost.' In literary history he is commonly said to have contributed to the art of novel-writing an unprecedented skill in drawing individual character or personality and of thus preparing the way for Richardson (q.v.) and Fielding (q.v.); and the proof of this remark lies in his lively sketches of the members of the Spectator Club, particularly Sir Roger de Coverly. As a stylist he has, in his own field of inoffensive social satire and gentle humor, no superior, and the famous phrase of Dr. Johnson that "Whoever writes to attain an English style, familiar but not coarse, and elegant but not ostentatious, must give his days and nights to the volumes of Addison," remains largely true. Addison brought English prose to a degree of finish and accessibility that had been wanting before. Even his great predecessor, Dryden (q.v.), one of the most flexible and easy of prose-writers, has not quite that sense of the audience which Addison possessed to so great a degree, and which is the basis of his secret of writing easy, readable prose. Technically, this is Addison's contribution to the art of expression.

Bibliography.— Editions of Addison's works are numerous. Bohn's 'British Classics' contains his complete works. 'The Spectator' was edited by Morley (1868) and by G. Smith (8 vols., 1898). The famous essays on Addison are Johnson's, in the 'Lives of the Poets,' Macaulay's 'The Life and Writings of Addison,' and Thackeray's in the 'English Humorists,' the two last being brilliant rather than sound. The life by W. J. Courthope in the 'English Men of Letters Series' (1884) is excellent, and is more convenient than the older and longer life by Lucy Aiken (1846). For Addison's place in literature consult Perry, T. S., 'English Literature in the 18th Century' (1883), and Beljame, A., 'Le public et les hommes de lettres en angleterre au XVIII siècle' (1881; 2d ed., Paris 1897); they are more satisfactory than the criticism in Taine's 'History of English Literature' (1863), or Professor Gosse's 'A History of 18th Century Literature, 1660–1780' (1889).

WILLIAM T. BREWSTER,
Professor of English, Columbia University.

ADDISON'S DISEASE, a disease associated with diminution of the functions of the suprarenal glands, a hypoadrenalemia. It is characterized by general depression of the mobility, as evidenced by pronounced muscular weakness (asthenia), by anæmia, lowered tone of the circulatory apparatus, irritability of the stomach and pigmentation of the skin. This last symptom is the most pronounced and was fully described by Addison in 1855. The disease is more common in men and between the twentieth and fortieth years. The heart muscle also suffers very markedly, there being frequent attacks of rapid and feeble pulse with vertigo, and fainting, sometimes fatal. Headache is frequent. In the pronounced types there is usually a severe disease of the suprarenal structures, most often a tuberculosis, less frequently a malignant disease (carcinoma). In mild inflammatory states of the adrenals, recoverable hypoadrenalemias may occur. Sudden death is a not infrequent result in acute hemorrhagic disease of the adrenals. A number of irregular forms of suprarenal disease are known, Addison's disease being but one of the more pronounced and terminal states.

The treatment is symptomatic with the prolonged use of the suprarenal gland. See ADRENALS.

ADDLED PARLIAMENT, The, a nickname given to James I's second Parliament, of 1614, because it passed no statute and finished no business. It did, however, settle a far more important question than any point of administration, namely, that the Commons were to have the power of the purse thereafter — that is, the rule of the kingdom — unless the Crown crushed them by force. In a word, it proclaimed the revolution, though not consciously. The previous Parliament had been dissolved for not granting supplies until the King had abolished the illegal imposts and regulated the Court of High Commission by statute — that is, given church as well as state into their hands. The elections for 1614 were contested with a passion unknown for generations; the court candidates were overwhelmingly defeated, and 300 of the victorious ones were new men sent up for the first time, among them John Pym, Thomas Wentworth (afterward Earl of Strafford) and John Eliot. After a two months' session they became involved in a quarrel of privilege with the Lords, and the King dissolved the House on that pretext,— really on the point of their refusal of supplies,— and imprisoned four of them.

ADDRESS, The, in British parliamentary procedure, is the answer to the King's Speech (q.v.) moved in both Houses. In former times it was composed of an answer to each paragraph in the speech, but it now forms a single resolution expressing the thanks of the House to the Sovereign for the speech. The debate on the address occupies the first days of the session, but both Houses show their independence by formally discussing other business before considering the answer to the King's Speech. The mover and seconder of the address are chosen from the younger sup-

porters of the Ministerial party. If any amendments condemning the policy of the government are moved to the address and carried, the ministry usually resigns.

ADE, George, American journalist and author: b. Kentland, Ind., 9 Feb. 1866. He made his mark as a writer of 'Stories of the Streets and the Town' in the Chicago *News*, which showed remarkable variety of motive and local reporters' knowledge. He published 'Artie,' made up from these, and 1897 the dialect story 'Pink Marsh'; in 1901–02 two sets of 'Fables in Slang,' full of pungent wit and intimate knowledge of the less agreeable phases of human character; in 1903 the satirical comic opera 'The Sultan of Sulu'; a musical comedy, 'The County Chairman'; a comedy of college life, 'The College Widow'; a play for William H. Crane called 'Father and the Boys.' Still other plays produced have been: 'Just Out of College,' 'The Fair Co-Ed,' 'The Sho-Gun,' 'The Old Town,' 'Marse Covington,' 'U. S. Minister Bedloe' and 'Nethe.' His published books, in addition to those mentioned above, include 'In Bahel,' 'The Girl Proposition,' 'People You Know,' 'Knocking the Neighbors,' 'True Bills,' 'In Pastures New,' 'The Slim Princess' and 'Ade's Fables.' Delegate to the Republican National Convention 1908, trustee Purdue University 1909, and member of the National Institute of Arts and Letters.

ADEE, Alvey Augustus, American diplomat: b. Astoria, N. Y., 27 Nov. 1842, son of a fleet surgeon; was secretary of legation at Madrid 1870–77, *chargé d'affaires* at different times; in 1878 became chief of the United States diplomatic bureau, 1882 third assistant secretary of state, in 1886 second assistant, which he still remains. He was secretary of state *ad interim* 17–29 Sept. 1898; and acting secretary during some of the most acute Chinese troubles of 1900.

ADELAER, ä'dĕ-lär (Norwegian, signifying "The Eagle"), the honor title conferred on KURT SIVERTSEN, Norwegian-Danish admiral: b. Brieg, Norway, 1622; d. Copenhagen, Denmark, 1675. After early service in the Dutch navy, he joined the Venetian navy and rising to the rank of squadron commander, achieved his most brilliant victory at the Dardanelles, 13 May 1654, when he compelled the Turks to surrender. He afterward became commander of the Danish fleet, but died suddenly when about to start on an expedition against Sweden.

ADELAIDE, capital of South Australia on the river Torrens, seven miles by rail southeast of Port Adelaide, on St. Vincent Gulf, and 506 miles northwest of Melbourne. It stands on a large plain, and is walled in on the eastern and southern sides by the Mount Lofty range; the town proper is enclosed by a wide belt of park lands, laid out in terraces, making it one of the most beautiful cities of Australia. It was first surveyed and staked off by Col. William Light in 1837, and named after the queen of William IV. The Torrens divides the town into North and South Adelaide, the former being occupied chiefly with residences and the latter forming the business portion of the town. Four substantial iron bridges span the Torrens, which has been formed by a dam into a lake one and one-half miles long. The streets are broad and regularly laid out, especially in Adelaide proper, to the south of the river, where they cross each other at right angles, and are planted with trees. Among the public buildings are the new Parliament Houses, erected at a cost of about $500,000; the government offices, post-office and town hall; South Australian Institute, with museum, library and art galleries; and hospital. There are a number of fine churches, including the Anglican Cathedral of St. Peter. The botanical garden covers more than 40 acres of ground, and many other beautiful parks and squares embellish the city. The chief manufactures are woolen, leather, iron and earthenware goods, and there are flour mills, mines and metallurgic works; but the chief importance of Adelaide depends on its being the great emporium for South Australia. The city controls the trade of the large back country and rich mining districts, which have a population of 200,000 within a radius of 10 miles from the town hall. Wool, wine, wheat, flour, copper, silver, lead, ores and concentrates, skins, butter, tallow and leather are the staple articles of export. The value of total exports in 1913 was $49,048,815; of imports, $36,741,700. Among the educational institutions the most important is the Adelaide University, with a working capital of $894,850, including a conservatory of music, schools of engineering, science and commerce. It was opened in 1876 and has about 1,000 pupils, and 25,000 volumes in its library. Other institutions include a school of mines and industries, the largest in Australia; St. Peter's Episcopal College; St. Barnabas Theological College, opened in 1881, and Prince Alfred (Wesleyan) College. It is the seat of an Anglican and of a Roman Catholic bishop. Adelaide, incorporated in 1840, is the oldest and third largest municipality in Australasia. The government is vested in a mayor elected annually, six aldermen elected for three years, two auditors and two councillors. Adelaide has been very successful in carrying on municipal enterprises. It is required that all the meat furnished to the population of over 200,000 must be slaughtered in the municipal abattoirs. The Municipal Tramway Trust operates the city and suburban electric lines, and the Municipal Harbor Trust conducts the business of the port. The city also carries on the usual public utilities — water supply, lighting, etc. Area, including parks, 3,700 acres. Pop. (1917), city proper, 43,438; metropolitan area, 205,443.

PORT ADELAIDE, its haven, dates from 1840. It is the principal port of call for vessels arriving from Europe; has a fine harbor, extensive quays and railway communication with Melbourne, Sydney and Brisbane. Pop., local gov. area, 24,015.

ADELARD, or **ÆTHELHARD,** of BATH, English philosopher and mathematician of the 12th century. Little is known of the facts of his life, except that he traveled widely, visiting Greece, Asia Minor and Africa. He wrote 'Perdifficilis Quæstiones Naturales' and 'De Eodem et Diverso,' a philosophical allegory in which he sought to reconcile the theories of Plato and Aristotle. He also made a Latin translation of Euclid and of several Arabian

mathematical treatises. See ARITHMETIC, HISTORY OF.

ADELBERT COLLEGE. See WESTERN RESERVE UNIVERSITY.

AD'ELIELAND', an Antarctic continent discovered 20 Jan. 1840 by Du Mont d'Urville. It consists of a chain of mountains without prominent peaks, with a few shallow bays filled with icebergs, and a number of islands with rounded summits.

AD'ELOCHOR'DA, a group standing at the base of the branch of phylum *Chordata*, and including certain animals, formerly supposed to be worms, but now placed in the same group as the vertebrates. The class *Adelochorda* is represented by *Balanoglossus*, while with it are provisionally associated two forms of doubtful position, the worm-like *Rhabdopleura* and *Cephalodiscus*. The *Adelocephala* are worm-like, but from the fact that the body is in part supported by a structure supposed to be homologous with the notochord of true vertebrates, and that the animal breathes through gill-slits, like those of the lowest vertebrates, it is supposed to be related to some extinct form which gave rise to the vertebrates. It is also itself probably an ancestral persistent form. If we throw out the doubtful forms *Rhabdopleura* and *Cephalodiscus*, leaving only *Balanoglossus*, we have the old group *Enteropneusta*. A typical example of the *Adelochorda* is *Balanoglossus* (q.v.).

ADELPHI, "The Brothers," the last and in the truthful portrayal of human nature, perhaps, the best of the six comedies of Terence, had its first performance in 160 B.C. The action turns upon an old yet ever new problem, whether a policy of good-natured indulgence which seeks, though it does not always win, mutual confidence between father and son, will lead to better results in the upbringing of young people than one of sternness and insistent preaching of duty. In the sequel neither plan is successful. Both of the young brothers (one of whom has been adopted by his uncle) compromise themselves by love-affairs. Terence, as his admirers might conjecture in advance, favors the principle of the 'golden mean' in education as in all other things. But while his answer to the problem of this play is no clearer than life itself commonly affords, the advantage on the whole appears to lie with the theory that parental authority, to be effective, must rest upon a friendly understanding and a tactful allowance for the difference in the point of view of youth and age. The general idea is worked out with great skill and abundant humor. The last act, in particular, is conceived in a spirit of drollery that is rare in Terence. The 'Adelphi,' like all of Terence's work, has had a great influence upon modern literature. Among the plays that are indebted to it may be mentioned Molière's 'École des maris,' Baron's 'L'École des pères,' Fagan's 'La pupille,' Garrick's 'Guardian,' Cumberland's 'Choleric Man' and Shadwell's 'Squire of Alsatia.' Sargeaunt's translation has been reprinted in the 'Loeb Classical Library' (New York 1912).

NELSON G. MCCREA,
Professor of Latin Language and Literature, Columbia University.

ADELPHI, a district in London, England, south of the Strand, close to Charing Cross. It was so named from the architects, four Scottish brothers Adams (Greek *adelphoi*, brothers). There is also a theatre of that name in the Strand.

ADELPHI COLLEGE, Brooklyn, N. Y., a college for women, non-sectarian, was incorporated by the regents of the University of the State of New York, 24 June 1896. It is intended to be a college of liberal culture. The requirements for admission and graduation are the same as those of the leading Eastern colleges. It is the only institution in Brooklyn in which a woman may obtain the usual baccalaureate degrees. The curriculum is arranged semestrally, and eight semesters are required for graduation. The courses in pedagogy are arranged so that the studies preparatory to the profession of teaching may all be taken as a part of the work offered for the degrees of bachelor of arts and bachelor of science. From the beginning the college has always offered special facilities to students who wish to enter the profession of teaching. It also makes provision in afternoon, evening and Saturday morning classes for teachers in public schools who desire to study for a degree without giving up their positions. Connected with the college are the Normal School for Kindergartners, with a two years' course, organized in 1893. The college reported in 1916: Professors and instructors, 30; students, 588; volumes in the library, 14,000. Adelphi College maintains a coeducational preparatory department, known as Adelphi Academy, which has 50 instructors and 760 students. The total value of the property and endowments of the college is $600,000. The total annual income is $118,000.

ADELSBERG, ä'dels-bĕrk, Austria, a market town of Carniola, 22 miles by rail northeast of Triest. Pop. 4,000. It is a favorite summer resort for tourists attracted there by the celebrated stalactite cavern which, with its four chambers and lateral recesses, was known as early as 1213, but was not rediscovered in modern days until 1816. The length of its underground passages, through part of which flows the river Polk, is over five miles; in 1890 a connection was discovered with the neighboring Ottokar grotto. About four miles to the north is the Magdalene grotto, noted for its extraordinary specimens of subterranean life.

ADELUNG, ä'de-lūng, **Johann Christoph**, German philologist, grammarian, lexicographer and librarian: b. Spanketow, Pomerania, 8 Aug. 1732; d. Dresden, 10 Sept. 1806. His services to the standardizing of the German language were of incalculable value. His chief works are: 'Grammatisch-Kritisches Wörterbuch der hochdeutschen Mundart' (1774–86); 'Ueber den Ursprung der Sprache und den Bau der Wörter' (1781); 'Deutsche Sprachlehre für Schulen' (1781); a periodical *Magazin für die deutsche Sprache* (1782–84); 'Ueber den deutschen Stil' (1785); 'Directorium Diplomaticum' (1802); and 'Mithridates, oder Allgemeine Sprachenkunde' (1806). Adelung was chief librarian of the Electoral Library at Dresden from 1787 until his death.

ADEN, ā'dĕn, or ä'dĕn, Arabia, peninsula and town belonging to Great Britain, on the southwest coast, 105 miles east of the strait of Bab-el-Mandeb, the entrance to the Red Sea. The peninsula is a mass of volcanic rocks, five miles long from east to west, and rising to 1,776 feet. It is joined to the mainland by a narrow, level and sandy isthmus. The town is on the eastern shore of the peninsula, stands in the crater of an extinct volcano and is surrounded by barren, cinder-like rocks. The main crater is known as the Devil's Punch-bowl. The climate of Aden is normally hot and dry with hot, sandy winds at certain seasons. The rainfall during 1916 was four inches, the average is three inches. The maximum temperature in 1916 was 101°, in July, and the minimum was 68.2°, in December. Nevertheless the climate is unusually healthy for the tropics. The Romans occupied it in the 1st century A.D. Till the discovery of the Cape route to India (1498) it was the chief mart of Asiatic produce for the Western nations; but in 1838 it had sunk to be a village of 600 inhabitants. The increasing importance of the Red Sea route gave Aden great value as a station for the British to hold; and in 1839 after a few hours' contest it fell into their hands. It is of high importance both in a mercantile and naval point of view, especially as a great coaling station; it has a garrison and strong fortifications. The population and resources of the place increased rapidly after 1838, and the opening of the Suez Canal in 1869 gave it a great impetus. The affairs of the port are administered by a board known as the Aden Port Trust. The annual gross revenue of the settlement is about $2,279,417. For purposes of government Aden is included in Bombay Presidency of India and the currency and postage stamps are the same as those used in that country. The rupee ($0.3244) is the currency unit. Whereas Aden of itself produces and consumes but little, conditions at the port are important, as it is the market through which a large commercial district is best reached. Aden's only industries worthy of mention are the manufacture of salt and of cigarettes. The total sea-borne merchandise trade for the year 1915–16 was valued at $31,804,667 against $27,875,101 in 1914–15. According to the Aden Port Trust returns, imports of merchandise in 1915–16 were valued at $17,010,190, as compared with $15,200,389 in 1914–15, and of treasure $1,305,702, against $1,996,230, respectively. Exports of merchandise increased in value from $12,674,712 in 1914–15 to $14,794,477 in 1915–16, but those of treasure declined from $2,601,368 to $1,890,934. Exports to the United States reached a value of $2,427,764, an increase of approximately 50 per cent over the exports for the preceding year and formed approximately 15 per cent of the total exports. Imports of American goods reached $2,595,600, practically double that for the preceding year. Cotton manufactures, grain and pulse, coffee, hides and skins, tobacco and coal are the chief articles imported. Exports include principally cotton manufactures, skins, coffee, grain, tobacco, spices, sugar, gums and salt. It is a telegraphic station on the cable between Suez and Bombay, and on the line to Zanzibar and the Cape. To provide for its growing population, a considerable territory on the mainland was acquired and added to the peninsula, the total area (including the island of Perim) being about 80 square miles. Population, about 46,000.

ADENEZ or **ADANS LE ROI,** ạd'nā or a'dăn-lĕ-rwä, a French troubadour and poet of the 13th century, attached to the courts of Henry III, Duke of Brabant, and of Guy de Dampierre, Count of Flanders. In 1270 he accompanied the crusade which ended disastrously at Tunis with the death of Louis IX, and returned by way of Sicily and Italy. His chief claim to remembrance is 'Cléomadès,' a long *roman d'aventures* based on Moorish and Spanish traditions, an edition of which in two volumes was published in Brussels (1863–66). His other poems are, 'Les enfances Ogier,' 'Berte aus granspiés' and 'Beuves de Comarchis.' His writings are distinguished by the purity of their French and by exact descriptions of places through which he traveled. His romances were edited by A. Scheler and A. van Hasselt for the Académie Impériale et Royale of Brussels (1874).

ADENEY, Walter Frederic, English clergyman, educator and author: b. Ealing, Middlesex, England, 14 March 1849. He was educated at New College and University College, London. For 17 years he was pastor of the Congregational Church, Acton. For two years he was lecturer in biblical and systematic theology at New College, London; 1889–1903 professor of New Testament exegesis and church history. Since 1903 he has been principal of the Lancastershire Independent College, Manchester. He has been a voluminous author, contributing nine volumes to the 'Pulpit Commentary,' two volumes to the 'Expositor's Bible,' editing the 'New Century Bible,' besides several volumes and many articles.

ADENITIS, ăd'ĕ-nī'tĭs, or **LYMPH-ADENITIS,** lĭm'făd-, inflammation of the lymphatic glands or of the vessels which lead into and bind them together. In either case the inflammation may become acute or chronic. The acute form is usually caused by a wound or a sore on the skin or mucous membrane. The inflammation then extends from the first lesion along the series of lymphatic vessels, causing intense pain in the glands with which these vessels connect. If the original wound or abrasion has been infected, the inflammation is accompanied by the gathering of pus around the glands. Where the inflamed condition is severe, fever, headache, sickness of the stomach and general prostration may be added to the symptoms. The chronic form of adenitis is usually caused by tuberculosis or syphilis. In such cases the treatment consists in putting the affected part at rest and applying moist, antiseptic dressings and regulating the bowels by means of diet and laxatives. If suppuration follows, the pus must be freed by lancing. When tonic and constitutional treatment fail, surgical removal of the enlarged glands is resorted to.

ADENOIDS, a term applied to an excessive growth of spongy tissue lying back of and above the soft palate. The growth may begin in early infancy, and if not removed

may continue until the age of puberty. In the first stages the tissue is soft and apt to bleed easily, but as the victim becomes older it grows fibrous and harder, sometimes causing an enlargement of the glands. Adenoid tissue is present in all normal children, the disease being merely abnormal growth of this tissue, due to various causes. Among these may be bad hygienic surroundings, improper diet, poor ventilation, and often, in large part, it is due to heredity. By filling the air passages adenoid growths render breathing difficult and cause a permanent expression of the features not unlike that of the feeble-minded. Sometimes the growth of the facial bones may be affected, the teeth being irregular, the upper jaw may become narrowed and the hard palate unduly arched. The mentality of the sufferer is also affected, the mind being sluggish and incapable of concentration. This condition is termed aprosexia. All the evils due to habitual mouth-breathing are also likely to result, such as bronchitis, weak lungs and asthma. Digestive disorder and catarrh of the stomach or of the intestines may also result from the constant swallowing of mucus.

Treatment is usually by means of surgical operation, which should be resorted to as soon as any of the above symptoms appear. The operation is without danger, except to those prone to excessive bleeding, on whom no operation should be attempted. Timely removal invariably causes a marked improvement in the child's mentality and physical condition. If, however, treatment is delayed until bone development has set in, absolute cure may be impossible, mouth-breathing having become a confirmed habit.

ADERNO, ä'dĕr-nō, Italy, town of Sicily, 22 miles northwest of Catania, near Mount Etna. It is famous as the historic Adranon, the site of the ancient Roman temple of Vulcan, guarded by a thousand gods, ruins of which are shown, and also of the city walls, founded by Dionysius I, 400 B.C. Here Timoleon defeated Hicetas of Syracuse, 344 B.C., and Adranon was the first city captured by the Romans, 263 B.C., in the first Punic war. The Norman castle and the convent of St. Lucia, dating from 1157, with its church columns of black lava and its frescoes representing Adelasia (granddaughter of Roger I, the founder) taking the veil, rise in the centre of the town. Aderno is a busy market town with an important trade in agricultural products. Pop. 30,200.

ADHEMAR DE CHABANNES, ą'dĕ-mar de shą'băn', French chronicler: b. Chabannes about 988; d. Jerusalem about 1030. He adopted a monastic life and wrote several works of which the most important is 'Chronicon Aquitanicum et Francicum,' or 'Historia Francorum' (3 vols.). The third volume covering the period from 814 to 1028, as a valuable historical source, is published in 'Monumenta Germaniæ historica' Band. IV (Hanover and Berlin 1826–92). Other works are published in Migne, J. P., 'Patrologia Latina,' (Tome CXLI, Paris 1844–55). Adhêmar died while on a pilgrimage to Jerusalem. Consult Molinier, F., 'Les Sources de l'histoire de France' (Vol. II, Paris 1902).

ADHESION, *in physics*, the force which holds together two surfaces brought in contact; distinguished from cohesion, the mutual attraction exerted by particles of the same body, and from affinity, since the particles adhering remain unchanged. It is a force exerted on each other by the molecules of the adhering bodies, and not to be confounded with mere mechanical contact due to pressure. The wetting of solid bodies is an instance.

It usually happens that when a solid and a liquid come in contact, a film of the liquid adheres to the solid too firmly to be detached, showing its adhesion to the solid to be stronger than the cohesion of its particles or the force of gravitation, as it can be removed only by forcible rubbing or evaporation. On the other hand, solutions are supposably cases where the adhesive force of solid and liquid overbalances the cohesive force of the solid, so that it loses its form and adheres particle by particle; but see SOLUTIONS, the true theory of which is keenly debated. The force of adhesion is measured by poising a metal plate on a balance, and then finding what additional force is required to detach it from the surface of a liquid which does not wet it (otherwise it would be measuring the cohesive force of the liquid) nor act on it chemically. The phenomena of capillary attraction depend on adhesion. Solid bodies also adhere to solids; most smooth surfaces will adhere; the smoother the tighter; and two plates of polished glass laid together can hardly be parted without breaking them. If the solids are pressed together, it usually increases the adhesive force; but it depends but little on atmospheric pressure. Friction is a looser kind of adhesion, which prevents surfaces moving freely on each other, and may result from gravitation or mechanical appliances. Plating, gilding, etc., also depend on adhesion. Soldering, the use of mortar, cementing, gluing, etc., are familiar applications of the principle, intermediary substances being employed, whose particles have at once great cohesion among themselves and great adhesion to each of the bodies to be joined. A familiar example is the splitting of a thin sheet of paper by pasting it between two sheets of cloth and pulling them apart after it has dried; the adhesion of paste to paper and cloth is so great that the paper fibres yield to it. Furthermore, air and other gases adhere to solids; a favorite children's experiment is to float a dry needle in a basin of water, it resting on a cushion of air; and when thermometers are filled with mercury it has to be boiled in them to expel the air that adheres to the glass. Every material body, and every particle of such body in however fine division, is surrounded by its own atmosphere of condensed gases, which are an efficient factor in many physical and chemical phenomena; this property in comminuted bodies is called adsorption, and in metallic substances is sometimes so avid that they grow red-hot.

In pathology, adhesion is sometimes applied to the closing of a wound. It occurs when two granulating surfaces are kept in contact that they may fuse and the wound unite by adhesion. The pleura, pericardium and peritoneum often adhere when inflamed, and in inflammations of the vermiformis appendix, pelvic organs, etc., more or less extensive adhesions

sometimes occur, and special operations may be necessary to allow the free functioning of the organs.

ADRABATIC TRANSFORMATION. See THERMODYNAMICS.

ADIABENE, ā'dē-ā-bē'nē, an ancient kingdom, lying between the Tigris and its two tributaries, the Upper and the Lower Zab. At one time it included all of Assyria proper and the Mesopotamian province of Nisibis and the district of Ecbatana. In 116 A.D. the country was conquered by Trajan, who made it a Roman province under the name of Assyria. Hadrian, however, allowed it to resume its autonomy under Parthian suzerainty. The capital of the kingdom was Arbela.

AD'IAPH'ORISTS, ā-di-af'or-ists, or **ADIAPHORITES,** a party or wing of the Lutheran reformers of Germany, who held that certain things practised by the Roman Catholic Church were indifferent and might be received. In 1548 an ecclesiastical controversy broke out among the reformers. The Emperor Charles V, having issued a paper popularly called the "Interim," in which he prescribed what faith and practice the Protestants were to adopt till the Council of Trent should dictate a permanent form of belief and worship, Maurice, Elector of Saxony, urged Melanchthon and his friends to decide what portions of the document they would accept and follow. Melanchthon considered that to a very large extent the "Interim" might be accepted and obeyed. A controversy in consequence arose between the followers of Luther and those of Melanchthon. It was called the adiaphoristic controversy, and embraced two questions: (1) What things were indifferent; and (2) whether, with regard to things indifferent, the Emperor could or could not in conscience be obeyed.

ADI-BUDDHA, ā-de-bud-hā, from the Sanskrit, the Primord Buddha, a conception of Buddha due probably to the influence of Christianity. It came into vogue among the Northern Buddhists about the middle of the 10th century. In this conception he is represented as self-existent and omniscient.

ADIGE, ā'dē-je, a considerable river of North Italy, which has its source in the Alps of Tyrol, above Brixen; it enters Italy by Bolzano and the valley of Trento, flows in a southern direction by Roveredo, parallel to and for the most part about six miles from the lake of Garda, then, turning abruptly toward the east, passes through Verona and Legnano; it afterward enters the great delta between the Brenta and the Po, and, forming several branches, empties its waters into the Adriatic Sea. It is a deep and rapid stream, dividing by its course the old Venetian territories from Lombardy proper. The valley of the Adige has been rendered forever memorable by the wars of Bonaparte.

ADI-GRANTH, ā'dē-grănth, the Bible of the Sikhs (q.v.), mainly compiled by the *guru* (spiritual guide) Arjun (1584–1606), fifth successor of the founder Nanak (q.v.). He gathered up the poetical pieces of his four predecessors and fragments from other great teachers like Ramananda, Kabir, Namdev, etc., and added compositions of his own. The tenth and last Sikh guru, Govind (1675–1708), made additions to it and composed an entirely new Granth, the "Granth of the Tenth Reign." The language of these is an archaic Punjabi called Gurmukhi ("from the guru's mouth"). These Granths, with the biographies of gurus and saints, and instructions for ritual and discipline, comprise the Sikh sacred books.

ADINOLE, a variety of the mineral albite.

ADIPATE, any salt of adipic acid (q.v.). Thus the compound of adipic acid with sodium is called sodium adipate.

ADIP'IC ACID, an organic acid having the formula $C_6H_{10}O_4$, and crystallizing in monoclinic liminæ which are sparingly soluble in cold water, but freely so in alcohol and ether. It melts at 300° F. and is formed by the action of nitric acid on natural fats.

ADIPITE, a gelatinous mineral substance of the same composition as chabazite (q.v.).

ADIPOCERE, ad'i-pō-sēr' (Lat. *adeps,* fat, + *cera,* wax), a fatty substance consisting largely of palmitic, stearic and margaric acids, combined to some extent with ammonia. It is sometimes formed by the decompostion of animal matter from which air has been excluded. It was first observed by Fourcroy. The most notable example of its occurrence was in the Cimetière des Innocens at Paris. A large number of coffins had been piled together in this cemetery for many years, and in 1786–87, when the coffins were removed, it was found that in many cases the corpses had been changed into shapeless masses of a dingy white color and waxy consistency, only the bones remaining unaltered. Adipocere is not a result of the decomposition of albuminous tissue, but is formed from the fats that are present in the body at the time of death, the fatty matter collecting together, undergoing further decomposition and finally losing its glycerine and oleic acid. A similar substance, called bog-butter, is occasionally found in peat bogs in Ireland and Wales. Sometimes spelled *adipocire.*

ADIPO'CERITE, a mineral better known as hatchettite (q.v.).

ADIPOSE TISSUE, animal tissue consisting of vesicles filled with fat or oil and supported by a network of capillary blood-vessels. Each drop of fat is confined within a protoplasmic envelope thickened at one part where a flat nucleus is found. Adipose tissue is found in a considerable layer under all skin surfaces, around the nerves and large vessels, and around the kidneys, joints, etc. The vesicles are round or oval, the tissue is organic and vital; fat is secreted from the blood-vessels. The fat is unorganized and devoid of vitality. Adipose tissue differs from cellular tissue in that the vesicles are closed so that even when fluid the fat does not escape.

ADIPOSIS DOLOROSA, a special form of endocrinopathy first described by Dercum in 1892, and characterized by enormous collections of fat in different parts of the body, not in the hands or feet, and associated with marked tenderness to pressure over the fatty deposits, neuralgic pains and other signs of interrelated endocrinopathic disturbance. It is but one of a group of related syndromes which are related to faulty metabolism of the fatty structures, chiefly of the skin.

Various types of lipomatosis belong in the group. The precise mechanisms which bring it about are not yet worked out, but pluriglandular defects are probably the chief endocrinosus glands at fault being a combination of the gonads (generative glands) and the thyroid. Opotherapy has occasionally been of service. Consult Jelliffe and White, 'Disease of the Nervous System' (1917).

ADIRONDACK MOUNTAINS, a group in the northeastern part of New York State, lying between the depressions occupied by Lake Champlain on the east, the St. Lawrence on the northwest and the Mohawk River on the south. The group is sometimes included in the Appalachian system, but physically and geologically the two uplifts are quite independent. The Adirondacks cover an area of more than 12,000 square miles and include within their limits most of the counties of Clinton, Franklin, Essex and Hamilton, and portions of St. Lawrence, Lewis, Herkimer and Warren. They are formed by several folds arranged parallel or *en echelon*, with a northeast-southwest trend, sloping on either side toward the narrow longitudinal valleys that separate the individual ridges. Most of the peaks have a rounded outline due to long-continued erosion, although in the northern part, where the highest elevations are found, the peaks are bold and picturesque and have bare rock walls rising several hundred feet in vertical escarpments. Avalanche Pass, Indian Pass and Wilmington Notch are the most noteworthy of several passes formed by these escarpments. The summit of the group is Mt. Marcy, 5,344 feet above the sea, and there are many prominences exceeding 4,500 feet, including Mt. McIntyre, 5,112; Skylight, 4,920; Whiteface, 4,872; Santanoni, 4,644; and Nipple Top, 4,684 feet. Toward the south and west the elevations become less pronounced and rise but a few hundred feet above the level of the plateau, which stands 1,500 feet or more above the sea. The parallel ranges are interrupted frequently by gaps or passes; some of them, like the Avalanche Pass and Indian Pass, possessing beautiful scenic features. Gorges and waterfalls occur along many of the stream valleys, the Ausable Chasm being especially noteworthy.

Rivers and Lakes.— The Adirondacks form the water parting between the Hudson and St. Lawrence, both of which streams receive many important tributaries from this region. Most of the western region drains directly into the St. Lawrence through the Oswegatchie, Grass, Raquette and St. Regis rivers, but a small portion is drained by the Black River, which flows into Lake Ontario. On the eastern side there are the Saranac and Ausable rivers and many short streams flowing into Lake Champlain. The Hudson River receives the waters of the Sacandaga, Indian and Boreas, and has its source in the interior of the mountains in the northeastern part of Hamilton County.

The lakes are perhaps the most attractive feature of the Adirondacks; they are distributed over the entire area to the number of many hundreds. The greater proportion lie in the larger valleys, to which they conform more or less closely in outline, being elongated along a northeast-southwest axis. Many, however, are nestled on the higher slopes at an elevation of 2,500 feet or more above the sea. Lake Tear of the Clouds on the crest of Mt. Marcy has an altitude of 4,320 feet. Lakes Champlain and George, the largest of the Adirondack lakes, are among the most attractive sheets of water in the United States. Among the smaller lakes much frequented by tourists are Long, Raquette and Blue Mountain in Hamilton County, the Fulton Chain in Hamilton and Herkimer counties, St. Regis and the Saranacs in Franklin County and Lake Placid in Essex County. Most of the lakes are of glacial formation, the outlets of the old rivers having been obstructed by deposits of glacial material.

Geology and Mineral Resources.— The strata of which the mountains are formed belong to the most ancient geological period, the Pre-Cambrian, consisting for the most part of crystalline formations which were uplifted long before the Appalachian ranges had been defined. Gneisses, granites and basic igneous rocks predominate, although there are small areas underlaid by limestones and quartzites. One of the most prominent types is a basic feldspar rock called anorthosite, composed almost entirely of the mineral labradorite. It constitutes the highest peaks in Essex County. On the borders these ancient formations are overlaid by early Paleozoic strata of Cambrian, Ordovician and Silurian age, which have been little disturbed from their original horizontal position. The whole region was invaded by the great northern ice-sheet, which eroded and polished the rock surfaces and upon its retreat left a heavy mantle of drift covering all but the highest elevations. Valuable ores and minerals occur at numerous localities. The deposits of iron ores have been of great economic importance, although in recent years the industry has suffered from competition with the Lake Superior and Pennsylvania ores, which can be extracted at much less expense. The mines of magnetite ore near Port Henry yield a large annual output, which is shipped to distant points for smelting. There are also deposits at Lyon Mountain, Lake Sanford and Benson Mines and other localities, which are not exploited at present. One of the richest graphite mines in the United States is located at Hague on Lake George. Garnet for abrasive purposes is mined in large quantities at North River, while extensive deposits of foliated talc occur near Gouverneur. Marble, granite and other stones suitable for building and other purposes are the basis of a large quarry industry.

Forests.— Pine, spruce and hard woods are found over extensive areas. Chestnuts are found in the lower and open valleys of the south and spruce is to be had only at an elevation of 1,000 feet or more above sea level. The mountains have been denuded of much of the larger timber and the principal lumbering industry is based upon the cutting of pulp-wood for paper manufacture. Spruce and poplar are most valuable for this purpose. The wholesale destruction of the forests has induced the State government to purchase extensive tracts with a view to forest-cultivation and to preserve the sources of the principal rivers. See ADIRONDACK PARK.

Game.— The Adirondacks are one of the favorite hunting-grounds of America. Owing to the stringent legal restrictions limiting the

season for killing game, there is an abundance of deer, rabbits, partridge (grouse) and waterfowl. Deer are hunted chiefly by stalking, the use of dogs being prohibited. Black bear and wildcats may be found in many parts of the mountains, but moose and caribou, which formerly were plentiful, have entirely disappeared. Several moose were introduced from other States in 1902 with the hope that they might again roam through the woods in numbers. Brook and lake trout and black bass are found in most of the streams and lakes and furnish excellent sport for the angler.

Resorts.— The climate of the mountains is bracing and healthful; in the summer season the heat is tempered by cool mountain breezes and by the elevation, and the severe cold of winter is made more endurable by the dry atmosphere. There are many sanitariums for invalids, especially for those afflicted with pulmonary diseases. The pleasure-seekers, who visit the mountains in great numbers, find ample accommodations in the many hotels and camps. The railway lines afford easy access to most parts of the Adirondacks, while by taking advantage of the network of rivers and lakes the most remote regions can be reached without much difficulty. During the summer months steamboats make regular trips for the convenience of travelers on many of the larger lakes. For geology and mineral resources consult Bulletins of the New York State Museum and Reports of the New York State Geologist; for forestry, the Reports of the State Forestry Commission; for botany, Reports of the State Botanist; all published at Albany. See NEW YORK (STATE).

ADIRONDACK PARK, a large district in the heart of the Adirondack region, principally forest land, set apart by the State of New York in 1892 for the conservation of the forest, protection of the watershed of the Hudson and other rivers of the State, for public recreation and for the practical study of forestry. (See CORNELL UNIVERSITY). It covers Hamilton County and parts of Essex, Franklin, Herkimer, St. Lawrence and Warren counties, and contains many mountains and lakes. It is over 3,000,000 acres in area, about 1,500,000 acres being State lands (which also form part of the Adirondack Preserve) and the rest being owned by lumber companies, associations, clubs and individuals. From time to time additions are made to the reservations, as the appropriations are available, and it is hoped that in time the whole region not under cultivation for crops will be under State control, and, while saved for the use of the people, will become a source of revenue to the State from the forestry industries.

ADIS ABABA, äd'dēs ą-bä'bą, Abyssinia, capital of the kingdom and of the province of Shoa, is situated 9,000 feet above sea-level on the southern slope of the Entotto hills. It consists of groups of villages and suburbs scattered around the Gebi or royal palace and enclosure placed on a small hill, commanding the whole neighborhood. There is telegraphic communication with Massowah, Harrar, Diré Dawa and the seaport of Jibutil in French Somaliland, whence a railway line to Diré Dawa 187 miles, on the southeast border of Abyssinia, is projected, via Harrar and the Hawask River, 300 miles to Adis Ababa. Telephone communication has been established with Harrar and intervening points. At the military camp a mile northeast of the palace are the seven batteries of artillery and mitrailleuses taken at the battle of Adowa, 1 March 1896. Adis Ababa, signifying "the new flower," was founded in 1892 by Menelek II after abandoning Entotto, 10 miles to the north. Here on 26 Oct. 1896 the treaty of peace between Italy and Abyssinia was signed. The population ranges from 50,000 to 70,000, about a third being of a floating character.

ADIT ("approach"), an underground passage with but one opening; distinguished from the tunnel proper, which has two. In military use, the burrow by which miners approach a place they wish to sap. In industrial mining, a gently sloping drift, used to drain a mine of the water coming into the workings from the top or sides or pumped up from below; usually but improperly called a tunnel. When there are two adits at different levels, the lower one is termed the "deep adit." The greatest in the United States is the Sutro Tunnel, 2,000 feet deep and 20,000 feet long, made in the palmy days of the Comstock Lode near Virginia City, Nev., to drain the mines along it.

ADITI, ad'ē-ti, in the mythology of the Hindu Rig-Vedas, Infinity, endued with life and form, from which are born the Adityas — the source and substratum of the universe; in later Vedic literature, the mother of the gods of storms (which are represented as life-producing), and of the sun. Aditi is the daughter of Daksha and wife of Kasyapa, and besides being the mother of the 33 gods and of the sun, was also the mother of the Tushitas, or the 12 Adityas. The latter in the Vedic literature numbered seven and are the gods of the heavenly light, with Varuna at their head. In the Brahmanas and later they numbered 12 with supposed reference to the months of the year.

ADIVE, a local Asiatic name of the corsac (q.v.).

ADJECTIVE. See GRAMMAR.

ADJOINING LANDOWNERS. The mutual rights, duties and liabilities of adjoining landowners are dependent on the general principle which requires one to enjoy his property in such a manner as not to injure that of another; but the application of this principle is to be limited so as not to restrain an owner of property from reasonable and prudent use and enjoyment of it. It is therefore a general rule of law that every owner of land has absolute dominion over it and may make any reasonable use of it he sees fit, and if injuries result to adjoining land by such use it is *damnum absque injuria.* The test as to whether a particular use of the premises is a reasonable one is whether or not it is such a use as, under the circumstances, an ordinary man would make of his premises, taking into consideration the importance of the use to the owner as well as the extent of the damage to be inflicted upon his neighbor, and if he uses ordinary care therein to prevent unnecessary injury to adjoining owners the fact that the use is one which will inevitably produce injury to such adjoining owners does not necessarily make it negligence.

ADJOURNMENT, technical law term, signifying the termination of a session of court, as distinguished from the suspension of a pending case, which is technically known as a continuance. Adjournment may be for a designated time, as from day to day, or it may be indefinite, in which case it is said to be "without day." When the period covers less than a day, it is called a recess. The suspension at the close of the day, when the session is to be resumed next morning, does not call for an order of adjournment, the session being deemed continuous.

ADJUDICATION, the term used in English and American law to denote the final decision in a proceeding in bankruptcy. The Federal Bankruptcy Act of 1898 defines it as "a decree that the defendant, in a bankruptcy proceeding, is a bankrupt." Former adjudication is a phrase often used, the rule being that persons shall not relitigate a case which has once been adjudicated between them.

ADJUSTABLE TRIANGLE, a triangle with a 45-degree angle in which the latter can be set to any degree very quickly by shifting the hypothenuse, and held in position firmly by clamping the thumb screw. It is divided into one-half degrees from 0 to 45 on the base of the angle. In drawing roof pitches, arch keys, towers, bay windows, etc., it is very convenient, as the lines can be drawn with absolute correctness; it is only necessary to measure one pitch, set the angle to it, move the hypothenuse along to every similar line, then turn the angle over, drawing the corresponding lines on the other side. It is also a great help in hydraulic and railroad engineering and drainage work. There is no better or quicker way of transferring angles from one drawing board to another than by means of this adjustable triangle. Parallel and vertical lines can be drawn with the utmost correctness. When lettering on drawings or tracings, etc., it is also very useful, as the letters A, K, M, V, W, X and Y are marked on the base of the angle, each giving the desired slope for these letters. The following 11 slopes are indicated on the bases of the triangle: 1:1, 1:1½, 1:2, 1:2½, 1:3, 1:4, 1:5, 1:6, 1:8, 1:12 and 3:4.

ADJUSTMENT, in insurance, is the determining the amount of a loss. No specific form is necessary to an adjustment. It must be intended and understood by the parties to a policy to be absolute and final, in order to render it binding. It may be made by endorsement on the policy, by payment of the loss or by the acceptance of an abandonment (4 Burr. 1966; 1 Camp. 134; 22 Pick. (Mass.) 191). If an adjustment is brought about by the fraudulent conduct of one of the parties, it will not bind the other person. (2 Johns. Cas. 233; 3 Camp. 319). If one party is led into a material mistake of fact by fault of the other, the adjustment will not bind him. (2 Johns. (N. Y.) 157; 2 Johns. Cas. 233).

ADJUTANT ("assistant"), in the armies of most civilized powers, a staff officer, the chief assistant to the commander of a regiment, battalion or squadron, in the drill and discipline of the troops, and their general management off the battlefield, and in such other duties as fall to the commander's charge. In the United States army he is appointed by the colonel for four years, has the rank of captain, and is not eligible to reappointment; he is the colonel's secretary, and is generally so indispensable that in time of war ambitious men often dreaded the appointment as death to further promotion. The squadron and battalion adjutants rank as lieutenants, are similarly appointed for two years, and have the same relation to their chiefs; there are also post, garrison and brigade adjutants. For further details consult the 'U. S. Army Register.'

ADJUTANT, a large stork (*Leptoptilus argala*) found in India and southeastern Asia, and so called by the English on account of its erect, officer-like appearance. Its Hindu name is "argala." Its height is about five feet, its spread of wings about 14 feet. The back and wings are slate-colored, the bare, flesh-colored head and neck are marked with black, and elsewhere it is white. The beautiful "maribou" feathers of commerce are taken from the under side of the wings. A pouch, which probably serves some purpose in connection with the organs of breathing, hangs from the under part of the neck and is capable of great distension. The bill is of great size, and the appetite of the bird is correspondingly large. It is a scavenger, its food being carrion, offal and small live animals, and it runs freely about Indian villages, protected for its useful works. The maribou of Africa is a closely related species.

ADJUTANT-GENERAL, an officer on the staff of the commander-in-chief, his secretary and principal assistant in issuing orders and supervising their execution, making reports and keeping registers, etc.; and having general charge of the drill and discipline of an army. In the United States army there is a department known as the Adjutant-General's Department, all the officers of which are above the grade of captain, and who have, in addition to the title of adjutant-general, the specific title of brigade or division adjutant when serving as such with a brigade or division in the field. The chief of the department has the rank of brigadier-general and the title of "the adjutant-general." He is charged under the direction of the secretary of war, and subject to the supervision of the chief of staff in all matters pertaining to the command, discipline, or administration of the existing military establishment, with the duty of recording, authenticating and communicating to troops and individuals in the military service all orders, instructions and regulations issued by the secretary of war through the chief of staff; of preparing and distributing commissions; of compiling and issuing the Army Register and the Army List and Directory; of preparing the annual returns of the militia to be submitted to Congress; of managing the recruiting service; of collecting military information, and with the custody of all official and historical records, including all pension, pay, bounty, etc., pertaining to or based on the military or medical histories of former officers or enlisted men. Individual States also have their own adjutant-general, with cognate duties regarding the State militia. In many countries, such as Germany and

Russia, the term has retained its original meaning of an officer on the personal staff, and is the designation of personal aides-de-camp to the sovereign.

AD'LER, Cyrus, American librarian and archæologist: b. Van Buren, Ark., 13 Sept. 1863. He was graduated at the University of Pennsylvania in 1883, and took the degree of Ph.D. in 1887 at Johns Hopkins University, where for several years he was instructor in Semitic languages. Since 1892 he has been librarian of the Smithsonian Institution; special commissioner of World's Fair to Turkey, Egypt, Tunis, Algiers and Morocco; president of the American Jewish Historical Society; president of United Synagogue of America, and member of numerous learned societies, such as the American Oriental Society, and the American Philosophical Society. He is the author of numerous articles on Oriental archæology, Assyriology, Semitic philology, comparative religion and bibliography; and one of the editors of the 'Jewish Encyclopædia.' He also edited the 'Jefferson Year-Book' (1899–1905), with Allen Ramsay; 'Told in the Coffee House' (1898); 'Jews in the Diplomatic Correspondence of the United States.'

ADLER, Felix, American lecturer and scholar: b. Alzey, Germany, 13 Aug. 1851, son of an eminent Jewish rabbi. In 1857 he emigrated to the United States, in which country and at Berlin and Heidelberg he was educated. After being for some time professor of Hebrew and Oriental literature at Cornell University he founded in New York (1876) the Society for Ethical Culture, of which he is lecturer. Similar societies have been established elsewhere in the United States and in other countries. He is an effective writer and speaker. He has published 'Creed and Deed' (1878); 'The Moral Instruction of Children' (1892); 'The Essentials of Spirituality' (1905); 'The Religion of Duty' (1912); 'Marriage and Divorce' (1915); 'The World Crisis and Its Meaning' (1915). In June 1902 he was called to the newly-created professorship of social and political ethics in the department of philosophy in Columbia University. From 1908 to 1909 he was American exchange professor at the University of Berlin. He has served for 10 years as chairman of the National Child Labor Committee.

ADLER, Friedrich, German architect: b. Berlin, 15 Oct. 1827; d. Berlin, 15 Sept. 1908. After finishing his studies at the Berlin Architectural Academy he traveled extensively. In 1863 he was appointed professor at the Berlin Academy, and from 1877 until he retired, in 1903, he was consulting architect to the Prussian minister of public works. Among his greater architectural works are the designing of Christ Church and St. Thomas' at Berlin, St. Paul's at Bromberg and the Church of the Redeemer at Jerusalem. He specialized in the architecture of ancient times and the Middle Ages and took a prominent part in the excavations at Olympia. Among his published works are: 'Mittelalterliche Backsteinbauwerke des preussischen Staats' (1858); 'Die Baugeschichte von Berlin' (1861); 'Baugeschichtliche Forschungen in Deutschland' (1870); 'Das Mausoleum zu Halikarnass' (1900); 'Zur Kunstgeschichte' (1906).

ADLER, Georg, German economist: b. Posen, Germany, 28 May 1863; d. 1908. He began his career as extraordinary professor of sociology at the University of Basel, Switzerland, then became professor of political economy at the University of Freiburg, Germany. In 1900 he was appointed professor of political science at Kiel University. His sociological writings tend strongly against the revolutionary programs of the socialist schools. His works are: 'Karl Marxsche Kritik' (1886); 'Internationaler Arbeiterschutz' (1888); 'Social-Reform und Theater' (1891); 'Staat und Arbeitslosigkeit' (1894); 'Die Social-Reform im Altertum' (1898); 'Geschichte des Sozialismus und Communismus' (1900); 'Ueber die Epochen der deutschen Handwerkerpolitik' (1903); 'Die Bedeutung der Illusionen für Politik und sociales Leben' (1904); 'Stirners Anarchist' (1907); 'Hauptwerke des Sozialismus und der Sozialpolitik' (1908).

ADLER, George J., German-American philologist: b. Germany 1821; d. 1868. He came to New York 1833; was graduated at the University of the City of New York 1844, and from 1846–54 was professor of German there. He published a valuable 'German-English Dictionary' (1848, many editions since), still very useful for its careful discrimination of synonyms; 'German Grammar' (New York 1868); 'Wilhelm von Humboldt's Linguistic Studies' (New York 1868), and translated Fauriel's 'History of Provençal Poetry.'

ADLER, Guido, Austrian writer on music: b. Eibenschütz, Moravia, 11 Jan. 1855. After studying in the gymnasium and university in Vienna, he continued his musical studies at the conservatory under Bruckner and Dessoff. In 1881 he was appointed lecturer on the science of music at the University of Vienna and in 1885 he became professor of music at the German University of Prague. In 1898 he returned to the University of Vienna as professor of the history and theory of music. Together with Chrysander and Spitta, he founded in 1884, the *Viertel jahrsschrift für Musikwissenshaft,* to which he was one of the most important contributors, writing on the history and theory of music. At the same time he began the publication 'Denkmäler der Tonkunst in Oesterreich,' published by Artaria in Vienna and by Breitkopf and Härtel in Leipzig and which is subsidized by the Austrian government. Up to 1913, 19 double volumes had appeared, containing works of the old Austrian composers or of such of the great masters who had lived in Austria. Many of the historical introductions are written by Adler himself. During the International Exhibition in Vienna in 1892 Adler acted as chairman of the historical section. The most important of his independently published works is 'Der Stil in der Musik' (1911).

ADLER, Hermann, Anglo-Jewish leader: b. in Hanover, 29 May 1839; d. London, 18 July 1911. He lived most of his life in England, where he held many positions of high trust connected with his race, having been since 1891 chief rabbi of the British Empire, and active in general benevolence. He was

principal of the Jews' College, London, 1863–91, and as chief rabbi became its president. Besides sermons, lectures, etc., he wrote 'The Jews in England,' 'The Chief Rabbis of England,' 'Ibn Gabirol, the Poet Philosopher,' etc.

ADLER, Nathan Marcus, German-Jewish leader: b. Hanover 1803; d. 1890. Educated at Göttingen, Erlangen and Würzburg, he became chief rabbi of Oldenburg 1830, of Hanover and the provinces 1831; and of the British Empire 1845. He was a chief organizer of schools for Jews in England, assisted Sir Moses Montefiore in raising the £20,000 fund for Palestine, was cofounder of the United Synagogue (association of the leading synagogues), and founder and first president of the Jews' College. He published several volumes of sermons and a commentary on the Targum.

ADLER, Samuel, German-Jewish rabbi and author: b. Worms, Germany, 3 Dec. 1809; d. New York city, 9 June 1891. After studying at the universities of Bonn and Giessen, he was appointed, in 1842, rabbi of the congregation in Alzey. In 1857 he came to the United States, being appointed rabbi of the congregation of Emanu-El of New York city. He was considered a profound scholar of the Talmud. His works include: 'Jewish Conference Papers' (1880); 'Benedictions' (1882); 'Kobez al Yad' (collections 1886).

ADLER, Victor, Austrian socialist editor: b. Prague, 24 June 1852. After studying in the University of Vienna he visited England, on whose system of factory inspection he wrote his first book. On his return to Vienna he founded a Social-Democratic weekly publication, which the Austrian government suppressed. He then founded and edited the *Arbeiter Zeitung*. He was for a time a member of the Lower Diet and, in 1907, became a member of the Imperial Council. His most important publication is 'Die Arbeiter Kammern un die Arbeiter' (1886).

AD LIBITUM, musical term, which implies that the part so marked may be played according to the taste of the performer and not necessarily in strict time. When there is an accompaniment to the music so marked it must strictly follow the ad libitum time of the principal performer. Ad libitum also frequently means that a part for a particular instrument, or instruments, in instrumental scores or pianoforte arrangements may be either played or entirely left out. Thus, a song written with 'cello accompaniment "ad libitum" may be sung to the piano accompaniment alone or with the 'cello added.

ADMINISTRATION, in general, the management of any business; especially executive government. In public affairs it refers to the actions of the government in exercising its authority agreeable to the constitution of the nation. The word is applied more commonly to the collective body of governmental officers exercising authority as an executive power. In a narrow sense it is used in America, in national politics, to designate the President and his cabinet, in State politics to designate the governor and his executive officers, or in municipal politics the mayor and heads of departments. In England the administration consists of the Premier and his cabinet, who hold office while their party has a legislative majority in the House of Commons.

In law the management of the personal estate of anyone dying intestate or without an executor. If the deceased leaves real estate, the estate devolves upon heirs related by blood; if personal property is left and no executors named, administrators are appointed. In the United States a surrogate or judge of probate appoints the administrator and grants letters of administration. The administrator is a trustee within the jurisdiction of a court of equity as well as of a court of probate. His duties are to inventory the estate, collect accounts due, pay all debts, and distribute the remainder among those entitled to it. In England the power of such appointment was vested in the ecclesiastical courts until 1857, when it was transferred to a court of probate. The personal property of a decedent is appropriated to the payment of his debts so far as required, and until exhausted must first be resorted to by creditors; but by certain statutes, courts may grant an administrator power to sell, lease or mortgage real estate when the personal estate of the deceased is not sufficient to pay his debts. At common law the real estate of an intestate goes to his heirs; the personal to his administrator. The fundamental rule is that all just debts shall be paid before any further disposition of the property.

Ancillary Administration.— That which is subordinate to the principal administration, for collecting the assets of foreigners. It is taken out in the country where the assets are locally situate.

Of Estates.— The term is applied broadly to denote the management of an estate by an executor, and also the management of the estates of minors, lunatics, etc., in those cases where trustees have been appointed by authority of law to take charge of such estates in place of the legal owners.

Foreign Administration.— That which is exercised by virtue of authority properly conferred by a foreign power. In England and in the United States the general rule is that letters granted abroad give no authority to sue or to be sued in another jurisdiction, though they may be ground for new probate authority. Consequently, when persons are domiciled and die in one country, as A, and have personal property in another, as B, the authority must be had in B, but exercised according to the laws of A. (Story, Confl. Laws, 23, 447). There is no legal priority between administrators in different States. The principal administrator is to act in the intestate's domicile, and the ancillary is to collect claims and pay debts in the foreign jurisdiction and pay over the surplus to his principal. (2 Metc. (Mass.) 114; 3 Day, 74). But some courts hold that the probate of a will in a foreign state, if duly authenticated, dispenses with the necessity of taking out new letters in their State. So it has been held that possession of property may be taken in a foreign state, but a suit cannot be brought without taking out letters in that State.

Public Administration.— That which the public administrator performs. This happens in many of the States by statute in those cases

where persons die intestate, without leaving anyone who is entitled to apply for letters of administration.

Jurisdiction over administrations is in England lodged in the ecclesiastical courts, and these courts delegate the power of administering by letters of administration. In the United States administration is a subject charged upon courts of civil jurisdiction. A perplexing multiplicity of statutes defines the powers of such courts in the various States of the Union. The public officer authorized to delegate the trust is called surrogate, judge of probate, registrar of wills, etc. As to surrogate courts and proceedings therein in the State of New York, consult the Code of Civil Procedure (Chase's ed. 1902, ch. 18). The death of the intestate must have taken place or the court will have no jurisdiction. A decree of the court is *prima facie* evidence of his death and puts the burden of disproof upon the party pleading in abatement. (26 Barb. 383.) The formalities and requisites in regard to valid appointments, and rules as to notice, defective proceedings, etc., are different in the various States.

Consult Goodnow, 'Principles of the Administrative Law of the United States' (New York 1905); id., 'Comparative Administrative Law' (New York 1893); Fairlie, 'The National Administration of the United States' (1905); Freund, 'Cases on Administrative Law' (St. Paul 1911); Schouler, 'Treatise on the Law of Executors and Administrators' (3d ed., Boston 1901); Williams, 'Treatise on the Law of Legal Representatives' (London 1899); Woerner, 'Treatise on the American Law of Administration' (2d ed., Boston 1899); Woerner and Wizlizenous, 'Law of Decedents' Estates Including Wills' (Boston 1913).

ADMINISTRATIVE DEPARTMENTS. See UNITED STATES — THE BEGINNINGS OF EXECUTIVE DEPARTMENTS OF THE; EXECUTIVE; CABINET AND CABINET GOVERNMENT; APPOINTMENTS; BUDGET SYSTEM; COMMISSION GOVERNMENT; and the departments by name.

ADMIRABLE CRICHTON, crē'ton (N. Irish Cri'ton). See CRICHTON, JAMES.

ADMIRAL (Arabic amīr-al or emīr-al, "commander of the" — whatever follows it), the highest rank of naval officer; the title of the general officer who commands a fleet or a subdivision of a fleet. As a naval term the word appears to have been used first by the Sicilians and then by the Genoese, from whom it was taken by the French during the crusades of the 13th century. By the end of that century the word had come into use in England to designate the officer in command of the Cinque Port ships. The French preserved the word without change, as *amiral,* and in France it was borne as the title of an office by the military, judicial and administrative officer known as *grand amiral,* in England as lord high admiral and in Spain as *almirante mayor.* In Spanish and Portuguese the word has developed into *almirante,* supposedly being derived from the Latin *admirari,* since the admiral "is to be admired" for surmounting all dangers and difficulties; both in Spanish and in Elizabethan English the word has been applied to the flagship of the commander of a fleet, the Spanish *almiranta* being the ship of the second in command and the *capitana* the ship of the ranking officer. In England the early forms were *amyrell,* and *admyrall,* the present form arising from a confusion with the Latin *admirabilis.* The first English admiral was William de Leybourne (1286) but he did not command the sea forces, his duties corresponding to those afterward vested in the lord high admiral, viz., the administrative powers now delegated to the lords commissioners of the admiralty and the judicial authority now belonging to the high court of admiralty. From 1632–50, from 1685–1702 and from 1708–1827 the duties of the office were performed by a board of commissioners, while under the Commonwealth a committee of Parliament administered the office. The last lord high admiral was the Duke of Clarence, afterward William IV. When he resigned in 1828 the office was put in commission, in accordance with a previous practice. In Spain the title of admiral is an hereditary honor still borne by the descendants of Columbus, the Dukes of Veraqua.

In the modern navy the admirals correspond to the general officers of the army. In the British navy there are four classes. There is an admiral of the fleet, corresponding to the field marshal and conferred at the sovereign's will, but it is little more than an honorary distinction. The three active ranks are those of admiral, vice-admiral and rear-admiral, ranking respectively with general, lieutenant-general and major-general. In former times there were also three subdivisions of each grade known as admirals (or vice- or rear-admirals) of the red, the white and the blue respectively; the color of the flag flown by the admiral (hence called flag-officer) corresponded with his section and all the ensigns and pennants of all ships under his command were of the same hue. This distinction is now abolished. The sea pay of an admiral of the fleet is £6 per day, of an admiral £5, of a vice-admiral £4 and of a rear-admiral £3; and an admiral commanding-in-chief is allowed £3 per day additional at home and £4 10s. abroad, as table money. In the British navy the vice- and rear-admiral are also honorary titles, without the active functions, conferred in compliment on senior naval officers. The former extensive functions of the admiral have been absorbed by the Crown and have been divided among other officials. In Russia the highest rank is that of lieutenant admiral-general. In other foreign navies there are admirals, vice-admirals and rear-admirals, whose duties correspond, save in minor details, to those of the above officers.

In the United States navy the three ranks of admirals were adopted during the Civil War period, the rank of rear-admiral being established by Congress in 1862 (as was also that of commodore, though this title had previously existed as one of courtesy, but without legal sanction); the rank of vice-admiral in 1864, when Lincoln was authorized to promote one of the rear-admirals to that position; and the rank of admiral in 1866, when Congress enacted a law providing an active list of one admiral, one vice-admiral and 10 rear-admirals. Originally these three grades were established for the express purpose of conferring exceptional honors and distinction upon David Glas-

gow Farragut (q.v.) and in order he became the first rear-admiral, first vice-admiral and first admiral. In 1866, when the rank of admiral was established and Farragut had assumed the rank, Rear-Admiral David D. Porter (q.v.) was promoted to vice-admiral, and in 1870, on Farragut's death, he became admiral. Rear-Admiral Stephen C. Rowan then became vice-admiral, but he died in 1890 and Porter in 1891, whereupon both grades were abolished. In 1899 the grade of admiral of the navy was established by Congress and conferred upon George Dewey (q.v.) as a reward for services at Manila Bay. This rank is a grade above admiral and resembles the rank of admiral of the fleet in the British navy. In 1882 Congress reduced the number of rear-admirals to six and the number of commodores to 10, but in 1899 increased the number of rear-admirals to 18, comprising two classes of nine each, and abolished the grade of commodore on the active list. The rank of rear-admiral is also borne by the chiefs of the Navy Department bureaus during their term of office. Originally the admiral, vice-admiral and rear-admiral of the navy corresponded to the general, lieutenant-general and major-general of the army, and various acts after 1862 confirmed these provisions, but the act of 1899, which abolished the rank of commodore, provided that the senior nine rear-admirals should rank with major-generals and the junior nine rear-admirals with brigadier-generals. The admiral of the navy and admiral receive $13,500 annually; senior nine rear-admirals, $8,000; and junior nine rear-admirals, $6,000; while an additional 10 per cent above these amounts is allowed for sea duty or shore duty beyond the continental limits of the United States. A retired officer receives 75 per cent of his active pay at time of retirement. The flag of the American admiral, which flies at the main, is rectangular and blue, with four white stars; that of the vice-admiral, flown at the fore, is similar but has only three stars; that of a rear-admiral, flown at the mizzen, is similar in shape but has only two stars and usually is blue, but if two or more rear-admirals be together, the senior flies a blue flag and the others red. See UNITED STATES, NAVY OF THE, and similar articles under the titles of the various nations.

ADMIRAL. (1) In entomology, a nymphalid butterfly — any one of several species, as the red admiral (*Pyrameis atalanta*), and the white admirals of the genus *Basilarchia*. (2) In conchology, one of the cones (*Conus ammiralis*). See CONE-SHELL.

ADMIRALTY, The. In Great Britain, the governmental department which manages all matters pertaining to the British navy and the royal marine. The admirality derives its character from the fact that it represents the lord high admiral, whose administrative functions have been transferred to and vested in a board of commissioners. Among the duties of these commissioners are the maintenance and expansion of the fleet according to governmental policy, keeping its roster filled with trained officers and men, and preserving it in the highest possible degree of preparedness and efficiency as regards personnel and material. The board consists of five lords commissioners, who decide collectively all important matters and who, in theory, are jointly responsible; they are the first lord, the first and second naval lords, the additional naval lord and controller, the junior naval lord and the civil lord who execute the office of lord high admiral, and with them are the parliamentary and financial secretary and the permanent secretary. The first lord, who is always a cabinet minister and who is responsible to the Crown and to Parliament for all admiralty business, besides having general direction and supervision, manages the political affairs of the navy, as its representative in Parliament, controls the naval estimates and finances and has charge of appointments, promotions and removals. The first naval lord is responsible for the commissioning of ships, the personnel of the fleet, its fighting efficiency and employment, its discipline and the appointment of inferior officers; he directs the operations of the admiral superintendent of naval reserves in regard to ships, the hydrographer, the director of naval ordinance and the naval intelligence department; and makes the necessary preparations to protect trade and the fisheries. The second naval lord has charge of the personnel of the fleet, the manning of the navy, and mobilization, supervises the training establishments and colleges, attends to naval education, training and the affairs of the royal marine force, appoints navigating officers and inferior officers and supervises the management of the reserve. The additional naval lord and controller has charge of everything pertaining to the material of the fleet, design, construction, machinery, equipment, dockyards and building establishments, gunnery and armament, maintenance repairs and refits and naval stores. The junior naval lord has control over the transport, medical and victualling services, the regulation of hospitals, the coaling arrangements of the fleet, of uniforms, prize money, naval savings banks, pensions and the appointment of chaplains, naval instructors, medical officers and officers of the accountant branch. Among the duties of the civil lord are the supervision of admiralty buildings and works, construction and labor, contracts and purchases of building stores and land, and the direction of the civil staff of the naval establishments; Greenwich Hospital is under his authority and the charitable funds, compassionate allowances, etc., are in his charge. The parliamentary and financial secretary has charge of the finances of the department, the navy estimates and general expenditures. The permanent secretary supervises and directs the general office work of the admiralty, of the military, naval and legal branches, the civil branch and the record office. When the prime minister resigns, all the lords of the admiralty do likewise and those who have seats in Parliament are succeeded by others.

ADMIRALTY AND MARITIME JURISDICTION. The system of law and procedure under which maritime transactions are regulated. It derives its name from the fact that it was originally administered in England by the lord high admiral. The modern laws have been adopted from the civil law and from such sea codes as those of Rhodes and Oléron (qq.v.). Article III, § 2 of the Constitution provides that the judicial power of the United

States "shall extend to all cases of admiralty and maritime jurisdiction" and as is the custom in Europe the United States Supreme Court has declared that by virtue of these words our admiralty courts shall entertain jurisdiction not only over the high seas but also over all public navigable waters, including interior lakes, rivers and canals, and that this jurisdiction is not confined to tide waters. The admiralty jurisdiction of the Federal courts is fixed by statute and in general covers cases that arise under contracts calling for the performance of certain duties or obligations upon navigable waters, such as contracts involving the transportation of passengers or merchandise between different States or foreign ports, cases of salvage, bonds of bottomry or hypothecation of ship and cargo, contracts (express or implied) for seamen's wages, seizures under the laws of impost, navigation or trade, cases of prize or ransom, charter-parties, contracts with materialmen, jettisons, maritime contributions and averages, policies of marine insurance, contracts for the furnishing of materials for or the making of repairs on foreign vessels, and generally to all assaults and batteries, damages and trespasses taking place on the high seas. Under war conditions the admiralty jurisdiction is extended so as to include the power to determine questions of prize. Crimes committed upon the high seas or beyond the jurisdiction of any country come under the jurisdiction of the admiralty courts, but as no crimes save those specified by statute are punishable in the Federal courts, the jurisdiction in this respect does not differ from that regarding other statutory offenses. A suit is commenced in admiralty by filing a libel, upon which a warrant is issued for the arrest of the person, or attachment of his property if he cannot be found, or a simple monition to appear; such proceedings are called actions *in personam*, that is, actions between individuals for tort or breach of contract. There may be a proceeding *in rem*, under which a warrant is issued for the arrest of the thing in question; in other words the proceedings are to determine the rights to or claims against a vessel or other particular subject-matter. In cases of actions *in personam*, the admiralty courts do not possess exclusive jurisdiction, since under the statutes the parties to such actions still retain their rights of action at common law; but in cases *in rem*, admiralty courts exercise exclusive jurisdiction and no other remedy can be sought in any other court. In the latter class of cases the vessel or other subject-matter involved must be brought by seizure or otherwise within the jurisdiction of the court. Since, in the United States, there are no courts whose duties and jurisdiction are confined to admiralty cases the district courts, by statute, have original jurisdiction in general admiralty and maritime cases and appeal may be made to the circuit court of appeals, but in a few specified cases and in prize cases the appeal is to the Supreme Court. The court usually tries admiralty cases without a jury, but in a few special cases trial by jury is provided by statutory provision. State courts have no admiralty jurisdiction. Among the more prominent cases in the Supreme Court are: Waring *vs.* Clark (1846), 5 How. 441; The Propeller Genesee Chief *vs.* Fitzhugh (1851), 12 How. 443; The Moses Taylor (1866), 4 Wall. 411; Insurance Co. *vs.* Dunham (1870), 11 Wall. 1; Leon *vs.* Galceran (1870), 11 Wall. 185; *Ex parte* Boyer (1884), 109 U. S. 629; Manchester *vs.* Massachusetts (1891), 139 U. S. 240. See COMMERCIAL LAW; LAW, MARITIME; INSURANCE, MARINE. Consult Benedict, E. C., 'The American Admiralty, Its Jurisdiction and Practice' (4th ed., Albany, N. Y., 1910). The early continental and English authorities are collected in Judge Story's opinion in the case of De Lovio *vs.* Boit (1815), 2 Gallison 398, 7 Fed. Cases, No. 3,776. The Laws of Oléron and other early maritime codes and ordinances may be found in Peter's 'Admiralty Decisions,' 1792–1807, Vol. I, App., and in the appendix to 'Federal Cases,' Vol. XXX.

ADMIRALTY INLET, a narrow body of water connecting Puget Sound with the Strait of Juan de Fuca.

ADMIRALTY ISLAND, a mountainous island, 90 miles long, off the west coast of Alaska, to the northeast of Sitka; belongs to the United States.

ADMIRALTY ISLANDS, a group of 40 islands, to the northeast of New Guinea; Basco, the largest of them, being 60 miles in length, mountainous, but fruitful. The total area of the islands is 878 square miles. They were discovered by Schouten in 1616. Carteret named them in 1767. Some are volcanic; others are coral islands. They abound in cocoanut-trees and are inhabited by a race of tawny, frizzle-headed savages of the Papuan stock, about 800 in number. Together with New Britain and some adjoining groups they were annexed by Germany in 1885, and now form part of the Bismarck Archipelago.

ADMIRALTY LAW. See ADMIRALTY AND MARITIME JURISDICTION; LAW, MARITIME.

ADMISSION. *In practice,* the act by which attorneys and counsellors become recognized as officers of the court and are allowed to practise.

In corporations or companies, the act of a corporation or company by which an individual acquires the right of a member of such corporation or company. In trading and joint-stock companies no vote of admission is requisite, for any person who owns stock therein, either by original subscription or conveyance, is in general entitled to, and cannot be refused, the rights and privileges of a member. Nothing more can be required of a person demanding a transfer on the books than that he prove to the corporation his right to the stock.

In evidence, a concession or voluntary acknowledgment made by a party of the existence of certain things or conditions, or of the truth of certain statements. The admissions or declarations of a party in respect to the subject-matter of an action at law or suit in equity may always be given in evidence against him. As distinguished from confessions, the term is applied to civil transactions, and to matters of fact in criminal cases where there is no criminal intent. Express or direct admissions are those which are made in direct terms. Incidental admissions are those made in some other connection or involved in the admission of some other fact. Implied admissions are those

which result from some act or failure to act of the party. To be considered as evidence, admissions may be made by a party to the record or one identified in interest with him, but not where the party of record is only a nominal party and has no active interest in the action.

ADOBE, ä-dō'ba (Sp., from *adobar*, to daub or plaster), colloquially "dobie": sun-dried bricks, from any native clays; especially those made in the arid western and southwestern regions of the United States, as in the Great Basin, Arizona, New Mexico, etc., by molding the bricks and then turning the sides alternately to the sun day by day for a week or two, stacking up for use when sufficiently baked. These, however, are the resource only of people in an inferior state of civilization, as the rain soon dissolves them into streams of mud; hence also they are impossible at all save where rain is very infrequent. The sizes are usually two, 18 x 9 x 4 and 16 x 12 x 4, the larger ones in the best building used as headers (the greatest length crosswise to the wall) and the others as stretchers (lengthwise). The earliest building material in Assyria and Egypt was adobe, usually strengthened with straw, and it is still much used in Japan and China. Adobe soils are clay soils very plastic when wet, but too hard for cultivation when dry; they are lightened by plowing in sand or sandy loam and are often very fertile.

ADOLESCENCE (Latin, *adolescere*, to grow up) is the period of life between the advent of puberty and maturity. Puberty, or the period when an individual first becomes capable of begetting or of bearing children, occurs approximately in the 12th or 13th year for girls and the 14th year for boys, though in individual cases its advent may be as early as the 10th or as late as the 21st year. These alterations of structure and function in the body which fit it for the processes of reproduction are the primary aspect of the period of adolescence on its physical side and the remaining phenomena, both physical and mental, which make the period so striking and so significant for psychology and education, can be shown to be related more or less directly to this fundamental process of preparing the body for its rôle in the perpetuation of the race.

Physical Changes.— Thus, on the physical side, measurements of the body and its capacities show during adolescence, and particularly in the four or five years from puberty onward, distinct acceleration in the rate of growth, and this acceleration begins earlier and ends earlier in boys than in girls, just as the onset of puberty itself is earlier in girls. The consequence of this sex difference in the appearance of adolescence is that for a time, approximately from the age of 12 to the age of 14½, girls are actually taller and heavier than boys of the same age, while in other respects, as for example in strength and in breathing capacity, the girls come near to, though they do not exceed, the capacity of boys during these years. These bodily changes at adolescence are prominent in every aspect of physical development; the bones not only lengthen and thicken but alter their shapes and their structure. The facial expression changes during this period and the shift in the shape of chest and pelvis, particularly in girls, is marked. There is quite exceptional growth of muscles. There are decided changes in the volume and capacity of the heart. The alteration in the dimensions of the larynx and its vocal cords is responsible for the characteristic mutation of the voice in boys. The brain, while not increasing appreciably in weight, certainly undergoes rather marked alterations in its connective systems, if we may judge from the corresponding alterations in instinctive tendencies, impulses, feelings and emotions and the obviously greater maturity of thought.

While all these physical changes are to be noted in adolescent boys and girls, it remains true that there is considerable unevenness in their appearance when we consider the individual rather than the group. It is agreed that one of the characteristics of the period is this increase in variability; there is more difference between individual and individual during adolescence than during the first 12 years of life, and this is true of all the aspects of development, both physical and mental.

Mental Characteristics.— On the mental side adolescence is characterized by analogous and equally striking alterations. The central phenomenon is the correlate of the physical changes of puberty, namely, the emergence and rapid development of sex feelings and impulses, in the widest sense of these terms. Thus, concomitant with the ripening of the sex instinct, appear such psychological manifestations as "showing off,' jealously, heightened consciousness of social relations, deeper and richer appreciation of beauty in all its forms, a wider range of ambitions and ideals, an enlarged mental horizon, new and more vital appreciation of moral and religious relations, a lessening of home ties with a corresponding augmentation of interest in the world's life outside the familiar circles of the earlier years. Mere maturity would account for a portion of these manifestations, yet psychologists detect the undercurrent of sex in all of them, so that they are to be regarded as primarily due to the irradiation or "sublimation" of the sex impulse.

The more direct expressions of the developing sex impulses are found in bashfulness, coyness, "showing off," sudden and strong attractions or repulsions for individuals of the opposite sex, new interest in dress and adornment and numerous vague, though emotional, responses to sex stimuli of all sorts.

For the best physical and mental development it is of the highest importance that these attitudes toward sex should be "normal" and wholesome. No one conversant with the facts doubts that boys and girls who are entering the period of adolescence ought to be sufficiently warned and protected as to keep them from vicious sex practices; it is perhaps less generally understood that there is danger of unwholesome mental attitudes toward sex and that there is corresponding need of guidance here. The forces liberated by the stimuli of sex can be diverted or "sublimated" in such a way as to provide a tremendous incentive toward sound mental development. The cardinal issue of moral training in adolescence is to divert the energies of youth into the best channels of effort, to replace crude and selfish by refined and unselfish interests; in short, to compass the shift from the natural egoism of childhood to the desired altruism of maturity.

Sex Hygiene.— In this connection much debate has arisen concerning the instruction of adolescents in sex hygiene. The problem is intricate and difficult. Perhaps the best opinion of experts would be that information concerning the elementary facts of sex ought by all means be given to children before the advent of puberty and preferably by their parents; instruction in childhood is easy because self-consciousness has not developed so far; children are naturally curious about these matters; their parents are the natural sources from which to seek information; if uninformed by their parents they will almost inevitably pick up from their associates misinformation of an appalling character. In addition, adolescent boys and girls ought to know the main facts concerning the physical changes going on in them at puberty, and they ought probably a little later to be given the main facts concerning venereal diseases, though without overstressing the pathological aspects in a lurid way. Instruction in adolescence, in any event, should not be restricted to the physiology and pathology of sex, but should include talks on the family, on divorce, on the larger social relations of the individual, all so couched as to appeal to the best emotions and stimulate the adolescent to a broad and wholesome attitude toward the participation which is about to be his in the life of his fellowmen.

Special Impulses.— Statistics show that adolescence tends to arouse the so-called migratory instinct. Running away from home, yearning for adventure, the *Wanderlust* appears to be stronger about the years 17 to 19 than at any other period. In boys, especially, this instinct is often seen clearly at work; no other explanation is adequate for the apparently motiveless way in which young boys suddenly strike out for themselves and leave perfectly comfortable homes. Closely akin to this is the "desire for activity" that figures so prominently in causes of withdrawal from school. Many writers feel that a serious attempt should be made in secondary education to supply in connection with the work of the school opportunities for satisfying this impulse to explore, to visit new places, to try new things, to be doing "something different."

Social Tendencies.— In adolescence all the tendencies that we term "social" are decidedly intensified. Wanting to be where others are, wanting to be liked by others, wanting to help others, entering seriously into the joys and sorrows of others; — these are all manifested in adolescence much more clearly and consistently than in childhood. It is obvious that these tendencies, all of which are instinctive attitudes more or less closely correlated with the sex impulse, have in themselves possibilities both of good or of evil. Parents and teachers must seek to direct these social tendencies so that good associates are preferred, so that the youth seeks the approbation of the best, so that the relations formed between the youth and his fellows make for his moral development and not his moral undoing. Naturally, at this age the appeal to social approbation is a powerful incentive; the adolescent boy and the adolescent girl will do what will secure the good opinion of their social group when they will be moved by no other motive. Similarly, the tendency during adolescence t form numerous social organizations — boy gangs, secret societies, literary societies, mus cal societies, sketch clubs, athletic association and the like — demands a reasonable amou of judicious supervision on the part of paren and teachers. Without such supervision ther is always danger of moral deterioration. Wit ness the very serious problem of the high school fraternity and sorority, which ha grown to such dimensions and assumed suc an aspect that secondary school teachers wit almost no exception view the movement wit alarm and have persuaded the legislatures o several States to forbid fraternity membershi to high-school students under penalty of sus pension or expulsion.

Mental Changes.— Religious conversion i essentially an adolescent phenomenon; th great majority of conversions occur during th ages of 15, 16 and 17. Even when the youn man or young girl fails to experience th typical conversion of the evangelical sort, he may be expected to undergo what might be termed a "secular conversion," to turn from selfishness to unselfishness, to reconstruct his attitude toward his fellows, to readjust his thinking so as to give due heed to the rights of others as compared with his own desires. In the later years of adolescence many young men and women also pass through a period of doubt, of skepticism, often of a serious sort. It is, of course, to be expected that the broadening intellectual horizon shall disclose inconsistencies between the newer views of life and the earlier notions of God, heaven, immortality, the nature of evil, the efficacy of prayer, the possibility of miracles, etc. Whether a different form of instruction in childhood might obviate the necessity of this reconstruction may be debated; in any event, adolescents need and deserve the utmost sympathy from those who are watching over their religious and moral development.

Akin to the growth of religious interests and the widening of social interests is the striking increase during adolescence in the range and variety of ideals; these differ in the two sexes, differ in the poor and the rich, differ with race but in all cases are prone to shift rapidly during the high-school ages. Since ideals form incentives to conduct of the most powerful sort, it is clear that parents and teachers must take definite measures to supply material for their formation, to check the unwholesome or unworthy, to encourage the wholesome and worthy.

In the opinions of some psychologists adolescence is accompanied by impulses which if unchecked, would carry their possesso "with almost resistless fury toward a life o crime." It is true that there is a sudden in crease at this period in the commission of cer tain types of criminal offense, of which lying stealing and vagabondage are most typical, an that we are prone to believe that all boys mus sow their "wild oats." Apparently, the men tal turmoil of adolescence brings it about tha certain young men and young women, befor they have become "converted," before the have made the adjustment of self to society and taken on the responsible attitude of th adult, do exhibit for a time "streaks" of law lessness, or rebellion against authority, but it i

rather too much to declare that adolescents as a group are predisposed toward criminality.

Instruction.— In the schooling of adolescents there would appear to be almost equally good arguments for and against coeducation. In larger communities with two or more high schools, experience shows that a separation by sex works well on the whole. No one doubts that girls can do as good work as boys. But they may compete with boys at the risk of their health, and they may, by the practice of coinstruction, be led to pursue a curriculum that is less well adapted to their prospective lines of activity. See CO-EDUCATION.

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GUY M. WHIPPLE,
Professor of Education, University of Illinois.

ADOLF OF NASSAU, ä'dôlf'. See ADOLPHUS OF NASSAU.

ADOLPHUS, or ADOLF, OF NASSAU, Emperor of Germany: b. about 1250; d. 2 July 1298. He was elected emperor 1 May 1292, and was crowned at Aix-la-Chappelle 25 June in the same year. He owed his election in part to intrigues with the Electors of Cologne and Mainz, who imposed on him the hardest conditions; but, refusing to fulfil them, he soon saw himself hated and deserted. Urged by want of money, he took £100,000 sterling from Edward I of England to assist him against Philip the Fair of France; but obeyed the Pope's prohibition with alacrity. He thus made himself contemptible to the German princes, and became still more odious by taking advantage of the hatred of Albert, Landgrave of Thuringia, against his sons, and purchasing this territory from him. This involved him in a fruitless five-years' war to subjugate his purchase. Disgusted, and urged on by Albert of Austria, the majority of the college of electors cited Adolphus before it; he failing to appear, the throne was declared vacant 23 June 1298, and Albert of Austria was elected. A war already existed between the rivals, in which Adolphus seemed superior until he was outmanœuvred and surrounded at Gallheim, and fell by Albert's own hand.

ADONAI, a-dō'nai, a Hebrew name for the Supreme Being; a plural form of Adon, "lord," combined with the pronoun of the first person. In reading the Scriptures aloud, the Jews pronounce "Adonai" wherever the old name "Jhvh" is found in the text; and the name "Jehovah" has arisen out of the consonants of "Jhvh" with the vowel points of Adonai.

ADONAIS, perhaps the most widely read of Shelley's longer poems, is together with Milton's 'Lycidas' the most highly wrought and finished of English elegies. Composed on the death of Keats, it has gained further pathos and interest from the fact that, as Mrs. Shelley pointed out, "it now seems more applicable to Shelley himself than to the young and gifted poet whom he mourned." When Keats died in Rome on 23 Feb. 1821, Shelley was moved not only by the early death of a poet whose work he admired, but also by the unfounded report that Keats' health had broken down under the savage criticisms of his poetry in the *Quarterly Review.* This absurd notion accounts for certain passages in the preface to 'Adonais' and for the five stanzas (27–29, 37–38) which attack the critics. The poem, which is in 55 Spenserian stanzas, was composed between the middle of May and the middle of June 1821; it was first printed at Pisa by 13 July, and shortly afterward in London. Shelley, whose criticism of his own poems is almost infallible, said that "'Adonais,' in spite of its mysticism, is the least imperfect of my compositions"; that it was "a highly wrought piece of art"; and that he should be surprised "if that poem were born to an immortality of oblivion." But Adonais was ignored by the contemporary public; only posterity has placed it among the supreme treasures of English song.

The first portion of 'Adonais,' which follows the classical tradition in the tone of its lament, is based primarily upon two famous Greek elegies, Bion's 'Lament for Adonis' and Moschus' 'Lament for Bion,' from which Shelley drew many details but which he actually recreates into an original and modern poem. The latter portion of the poem is wholly original in both imagery and thought, and closes in the manner of Spenser and Milton, with a pæan of immortality and the assurance of personal triumph over death. "'Adonais,' as a work of art, effects this evolution of life out of death, with more unconsciousness, greater unity and steadfast tendency, with passion more spontaneous and irresistible, with melody more plaintive, eloquence more sweet and springing, imagination more comprehensive and sublime, than any other English elegy. It is artificial only to those whose minds are not yet familiarized with the language of imagery,— those to whom the gods of Greece speak an unknown tongue; it is cold only to those who confound personal grief with that universal sorrow for youthful death which has been the burden of elegy from the first; it is dark with metaphysics only to those who have not yet caught a single ray from the spirit of Plato" (Woodberry, Cambridge ed. Shelley's Poetical Works). The most eloquent expression of Shelley's philosophy of life and death is found in the latter portion of 'Adonais.' Here the poet utters at first a kind of pantheism, but from this, as if unsatisfied with so impersonal an immortality, he finally passes into a rapturous assertion of immortality conscious and personal. The concluding stanzas attain a majesty and splendor unsurpassed in English lyrical poetry. 'Adonais' was edited by Rossetti (Clarendon Press, 1891). Consult also Dr. Richard Acker-

mann, Quellen, Vorbilder, Stoffe zu Shelley's Poetischen Werken (1890); and Woodberry's introduction and notes in the Cambridge ed. of Shelley. MARION TUCKER.

ADONIJAH, the fourth son of King David, by Haggith. His claim to the throne was best after Absalom's death, and the chief commander Joab and the high-priest Abiathar supported him; but the captain of the body-guard Benaiah, the priest Zadok, the prophet Nathan and Solomon's mother Bathsheba, induced the old King David to make Solomon associate at once. Adonijah fled to the tabernacle for protection; but after the death of David he was slain by order of Solomon on the pretext that his request for a concubine of David's was a claim to the throne.

ADONIS, a-dō'nis, in Greek legend, son of Myrrha, daughter of Cinyras King of Cyprus: born in Arabia. Before the birth of her son she was transformed into the tree which produces the fragrant gum called by her name; this, however, did not hinder his being brought into the world in due season. He grew up a model of manly beauty and was passionately beloved by Aphrodite (Venus), who quitted Olympus to dwell with him. Hunting was his favorite pursuit, until, having gone to the chase against the entreaties of his mistress, he was mortally wounded in the thigh by a wild boar. Venus, coming too late to his rescue, changed his blood into flowers. After death he was said to stand as high in the favor of Persephone (Proserpine) as before in that of Aphrodite; but, the latter being inconsolable, her rival generously consented that Adonis should spend half the year with his celestial, half with his infernal mistress. This is a highly decorated form; the simpler and older myth seems to have been that Aphrodite and Persephone contested the beautiful child's possession, and Zeus ordered that he should spend four months with each and four as he chose. The fable has been variously interpreted. The alternate abode of Adonis above and under the earth is typical of the burial of seed, which in due season rises above ground for the propagation of its species. How much of the myth was cause and how much result of the famous Greek woman's festival, the Adonia, cannot be said. This represented the union of Adonis and Aphrodite on one day and the sorrow over his death the other, and the women performed the funeral rites over small images of him; also planting quick-growing herbs like fennel and lettuce in shards filled with earth, and throwing them into springs after the burial. It was a worship of the reproductive principle of plants, which after a short life die and are buried and again spring up; naturally, it was involved with the grossnesses of phallic worship, for which all growth-cults tended to be an excuse. The name is Semitic, *adon*, "lord," — though of course all the local gods were "adons" of the place,— and the cult was widespread in the east; in Phœnicia the Adon was termed Thammuz, "the hidden." The Greek celebration was often performed by the priestesses of Aphrodite, courtesans; but Theocritus' charming Idyl XV shows that in his time at least it was perfectly respectable for decent women to attend.

ADONIS, a genus of plants of the family *Ranunculaceæ*, or crowfoot family. The plants are natives of Europe, and only a single species, *A. autumnalis*, the "pheasant's eye" of the flower-garden, is grown commonly in the United States. It is a low leafy annual with scarlet or crimson flowers, darker in the centre. It is said to have been stained with the blood of Adonis.

ADONI-ZEDEK, a-dō'nai tzh-ē-dēk, King of Jerusalem at the time of the invasion of Canaan by the Israelites under Joshua. He was the head of an alliance of five kings designing to stop the progress of Joshua's invasion. The kings were defeated and took refuge in a cave. By Joshua's order the mouth of the cave was closed and a guard set until the pursuit was over. The kings were then brought out and made to prostrate themselves, when Joshua and his generals placed their feet upon the necks of the kings in token of triumph. The kings were then executed and their bodies hung on trees until evening when the bodies were taken down and put in the cave which was blocked with stone.

ADOPTIAN CONTROVERSY, The, one which arose in Spain toward the end of the 8th century. Its leaders were Felix, bishop of Urgel, and Elipand, archbishop of Toledo; they modified the doctrine of Nestorius (see NESTORIANISM) to the opinion that Christ was the Son of God only in his divine nature, and in his human nature only so by adoption. It was hoped that this doctrine would be more acceptable to the Mohammedans than the orthodox view, and a means toward their conversion; and Elipand was a zealous missionary among them. Felix introduced it into Frankish Spain, and Charlemagne called a synod at Regensburg (Ratisbon) in 792 to have him explain and justify it. Instead he renounced it, confirming the renunciation by a solemn oath to Adrian I, to whom the synod sent him; yet on returning to his diocese he taught it as before. Another synod was held at Frankfort in 794, and the doctrine was formally condemned, neither Felix nor any of his followers attending. After some controversy a commission of clergy was sent to Spain to put down the heresy. Leidrad, archbishop of Lyons, one of the commission, persuaded Felix to go before a synod at Aix-la-Chapelle in 799 and recant; which after a week's dispute with the great Alcuin he did, and was prevented from further relapse by being kept under surveillance at Lyons for the rest of his life, to 816. Elipand, at Toledo, maintained his Adoptian views despite their ban by the Church; but after his death they were abandoned by practically all. Occasional advocates afterward arose during the Middle Ages, however, and the question has been discussed even in modern times.

ADOPTION, the act of taking a stranger into one's family, as a son or daughter; or the taking of a person, a society, etc., into more intimate relations than formerly existed with another person or society; or the taking as one's own, with or without acknowledgment, an opinion, plan, etc., originating with another; also the selecting one from several courses open to a person's choice.

In law, both ancient and modern, the act of taking a stranger into one's family constituted the person so adopted one's heir to all intents and purposes. The practice was common among the Greeks and Romans, and is still in use among some modern nations.

A proceeding which so materially affects the succession of property and the rights of natural heirs is a very important one. It is not recognized by the common law of England, and exists only in the United States by special statute. Comparatively few of the States have engrafted it upon their systems of jurisprudence. But among many of the Continental nations it has been practised from the remotest antiquity. The effect of adoption was to cast the succession on the adopted in case the adopting father died intestate.

The statute in force in the State of Michigan is substantially similar to other statutes in the various States upon the subject. The Michigan statute provides, among other things, that the person or persons so adopting such child shall thereafter stand in the place of a parent or parents to such "child-in-law," and be liable to all the duties, and entitled to all of the rights, of parents; and such child shall thereupon become an heir-at-law of such persons, the same as if he or she were in fact the child of such person or persons.

Adoption by matrimony is the placing the children of a former marriage on the same footing, with regard to inheritance, etc., as those of the present one.

Adoption by testament is the appointing of a person one's heir on condition of his assuming the name, arms, etc., of his benefactor.

Adoption by hair was performed by cutting off the hair of the person adopted and giving it to the adoptive father.

Adoption by arms was the presentation of arms by a prince to a brave man. These the recipient was expected to use for the protection of his benefactor.

In heraldry, arms of adoption are the heraldic arms received when the last representative of an expiring aristocratic family adopts a stranger to assume his armorial bearings and inherit his estates. The recipient may obtain permission from Parliament to take the name of his benefactor, either appended to, or substituted for, his own.

In Scripture and theology, the act of admitting one into the family of God, or the state of being so admitted. The previous position of the person adopted in this manner was that of a "servant," now he is a "son," an "heir of God," and a "joint heir with Christ."

In ecclesiastical language, adoption by baptism is the act of becoming godfather or godmother to a child about to be baptized. Unlike real adoption, however, this does not constitute the child heir to its spiritual father or mother.

ADORATION, in unspecialized modern usage, a spiritual homage to God; but originally an act to express obedience and reverence performed before the images of the gods. Among the Romans it was performed by raising the hand to the mouth, kissing it, and then waving it in the direction of the image; the devotee had his head covered except before Saturn and Hercules, and after the act turned himself around from left to right. Sometimes he kissed the feet or knees of the images. This homage was afterward transferred to the emperors, by bowing or kneeling, laying hold of the imperial robe, and then pressing the hand to the lips. The Oriental methods were of course still more abject,— bending the knee, falling on the face, striking the earth with the forehead and kissing the ground or floor. Alexander borrowed this from the Persians and made it a feature of his court; the rough Macedonian Cassander burst into a roar of laughter when he saw the Persian grandees performing this *kotow* (the Chinese term for the same act) before Alexander, who was so enraged that he seized him by his long hair and dashed his head against the wall. But the Greeks considered it impious and degrading, and the best of them would not bend to it; Conon refused it to Artaxerxes, and Callisthenes to Alexander. The abject degradations which the mediæval far-Eastern rulers exacted from foreign traders, by submitting to which the Dutch purchased trade privileges, though the English would not,— crawling on the face from the door to the monarch's seat, licking up the dust as they went, till the victim was often unable to speak when he reached it, and could only gasp with his mouth full of dirt,— are well known. Milder forms in modern times, hardly thought degrading even by the sturdiest democrat, are kneeling and kissing the monarch's hand; and the similar homages of lovers have never been considered so. The ceremony of kissing the cross embroidered on the Pope's slipper is a like form, said to have been borrowed from a similar ceremony introduced by the Emperor Diocletian, who greatly extended court ceremonial. The original signification of the word as an act and not an emotion is preserved in the marriage service of the English and Protestant Episcopal Churches, "with my body I thee worship." In the Roman Catholic Church, also, a distinction is made between *latria,* the worship due to God alone, and *dulia* the veneration paid to the Saints, and *hyperdulia,* that accorded to the Virgin.

ADOUR, a river of southern France, having its source in the mountain ridge of the Tourmalet, in the department of Hautes-Pyrénées. Its course is first north, then west, southwest and south southwest, passing St. Séver and Dax, to the former of which it is navigable, and falling into the sea a little below Bayonne, flowing through many exceedingly fertile valleys. Its whole length is estimated at about 200 miles. The current is rapid, and sometimes serious inundations are caused by the melting of the snows on the slopes of the Pyrenees. At the mouth of the river there is a shifting bar.

ADOWA, or **ADUA,** ăd'ô-ą, Abyssinia, capital of Tigré province; on the left bank of the Hassam, a tributary of the Tacazzé, 6,000 feet above the sea, about 10 miles east of Axum. It is the chief commercial depot on the great caravan route from Massowah to Gondar, about 110 miles from the former. Though it still carries on some trade and has manufactures of cotton cloths, iron and brass ware, owing to the Abyssinian civil wars it has greatly declined from its former prosperity and presents a rather miserable appearance. The inhabitants, numbering about 5,000, are considered the most civilized of the Abyssinians. It was here that

the Italian General Baratieri was defeated by the Negus Menelek, 1 March 1896, when 7,000 men, 250 officers and the whole artillery were lost.

ADRA, ä'drą, (the ancient ABDERA), seaport of southern Spain, in the province of Almeria, 29 miles west southwest from the town of that name, near the mouth of the Adra, on an eminence facing the Mediterranean. The inhabitants are employed in agriculture, fishing, distilling brandy and manufacturing lead from the ore produced from the extensive mines in the neighborhood. Pop. about 12,000.

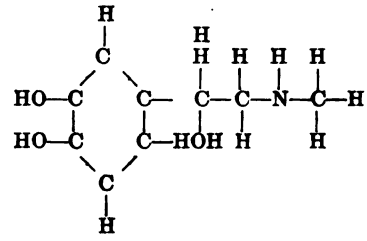
ADRAR', ą-drär', Sahara, a district peopled by Berbers, possessing camels, sheep and oxen and cultivating dates, wheat, barley and melons. Chief towns, Wadan, pop. 4,000, and Shingit, which has inexhaustible beds of rock-salt. The region embraces about 30,000 square miles and since 1892 is a part of the French possessions.

ADRASTUS, in Greek legend, King of Argos, son of Talaus and Lysimache. Polynices, being banished from Thebes by his brother Eteocles, fled to Argos, where he married Argia, daughter of Adrastus. The King assisted his son-in-law, and marched against Thebes with an army led by seven of his most famous generals. All perished in the war except Adrastus, who, with a few men saved from slaughter, fled to Athens and implored the aid of Theseus against the Thebans, who opposed the burying of the Argives fallen in battle. Theseus went to his assistance and was victorious. In a later story Adrastus after a long reign died from grief occasioned by the death of his son Ægialeus. He was worshipped at Sicyon, Megara and Athens, perhaps also at Argos and the Troad. See ARGOS; THEBES.

ADRENALS, also known as suprarenal glands. Paired structures, which in the human animal are located in the kidney fat just above the kidney. They have no physiological relation with that organ. They are a vital necessity to life and removal of the glands by accident, experiment or disease causes almost instant death. Disorders of the glands are numerous and of enormous importance to the well being of the body since by their internal secretion, the hormone, known as adrenalin, the blood pressure of the body is regulated. They belong to a group of structures, known as the glands of internal secretion, which are a part of the vegetative nervous system of the body, and the action of the hormone is chiefly made effective through the sympathetic fibres of this vegetative nervous system.

The suprarenal glands are made up largely of chromaffine tissue, which like the cells of the sympathetic ganglia is derived from neuroblasts of the central nervous system. The cortex of the suprarenals is made up of entirely different types of cells. Chromaffine cells are found also in the sympathetic paraganglia of the solar plexus, Zuckerkandl's aortic ganglia, the cardiac paraganglia, the coccygeal and cartoid ganglia of Luschka, and the tympanic paraganglia. The tissues themselves are richly supplied with sympathetic nerve fibres.

The chromaffine tissues produce a true internal secretion adrenalin, whose chemical composition is known: ortho-dioxy-phenyl-ethanol-methylamine.



Its nearest relative is tyrosin, a well-known product of protein decomposition. The chief action of adrenalin is through the sympathetic nervous fibres increasing their reactive capacity, or sensitizing them as it were. The routine function of the chromaffine tissue is to react to metabolic stimuli largely in response to desire and fear. Their emergency function, as Cannon has termed it, is to provide the necessary over-response to emotional hyperactivity, i. e., to increased or diminished desire and fear — which, as their correllates love and hate, are the ultimate expressions in the symbolic sphere of what are instinctively known as useful or harmful agencies to the organism and to the race. This over- or under-response brings about, through widespread vegetative nervous system activities, including those upon other endocrinous glands, the approximately necessary metabolic adjustment. This takes place chiefly through the regulation of the blood volume and of the organic and inorganic constituents of its plasma. Adrenalin itself is present in the plasma in proportions of 1 to 20,000,000. Notwithstanding this extreme dilution it acts upon unstriped muscle fibre and on sympathetic receptors. Adrenalin then is a typical product which demonstrates the metabolic regulation mechanisms of the vegetative nervous system. In addition to this broad function of keeping the sympathetic nerve fibres in adjustment it has certain specific functions, over- or under-activity of which give rise to a typical hyperadrenalemia and to hypoadrenalemias. The latter syndrome, when well developed, is known as Addison's disease.

Furthermore, very minute amounts produce results antagonistic to those from large doses. This bears upon the facts known concerning the antagonisms of sympathetic and autonomic impulses. This idea should prove of service in the entire range of opotherapy in calling attention to the results obtained by large and by small doses.

Hypoadrenalemia.— The most acute form which is present in complete or great loss to the suprarenals is rare. Pende, in 'Patologia del' apparato surrenale' (Milan 1909), has described six types to which he gives the names impromptu death of suprarenal origin, pseudoperitoneal type, cholera-like or gastro-intestinal adrenalemia, apoplectiform type, meningoencephalitic type and myocardial type. In the first form individuals suddenly die without warning, without symptoms save perhaps an epileptiform cry or acute dyspnea or angina. Caseous degeneration of the suprarenals has been observed. The pseudoperitoneal forms resemble an inexplicable attack of acute peritonitis with death. The gastro-intestinal form behaves

like an acute poisoning. The apoplectiform resembles a cerebral hemorrhage, but autopsy has shown no cerebral defect but suprarenal hemorrhage. The cases are extremely difficult of diagnosis and are rarities. Less severe types may be met with, among which the attacks of vomiting of pregnancy may be considered.

Addison's Disease.— This is a more chronic type due to more or less total involvement. As early as 1855 this disorder was first described by Thomas Addison whose outline practically covered the essential symptomatology. It is a disorder of adult life, 30 to 40 years. Its chief features are a gradually developing asthenia, with arterial hypotension. There is morning nausea or vomiting, lumbar pains, an advancing yellowish pigmentation of the skin and mucous membranes, amyatrophy. depression, unwillingness to do anything, with episodic occurrence of myoclonic, tetanoid or epileptiform convulsions with periodic palsies, confusional states, delirium, chronic paranoid ideas, coma, death. The chief lesion found is tuberculosis of the medulla of the suprarenal glands. The more complete symptom picture may be consulted in works on general medicine.

Partial Hypoadrenalemias.— These have been termed the abortive or latent types of Addison's disease. The melanoderma is absent, but the other symptoms noted are observed. Constitutional hypoadrenalemic states no doubt are very numerous and show themselves as rare and obscure forms of lowered vascular tonus, cardiac instability, muscular asthenia, visceral and ligamentous ptoses. These are often correlated with a chronic sclerosing adrenal.

Hyperadrenalemia.— Several types are known, the most striking of which are: (a) Genito-adrenal syndrome of pseudohermaphroditism, (b) virilism, (c) precocious macrogenitosomia. The fact that these syndromes occur only in women, as well as the pathological data, point to a simultaneously invoked ovarian disturbance. These are feminine hermaphroditic forms externally with virile secondary male sexual characters. The earliest case reported was by Creechio in 1865, of a woman of 52, taken to be a man. She had a large penis-like clitoris with hypospadias, no scrotum nor testicles, a uterus with two tubes, two ovaries without trace of corpora lutei, and an enlarged and voluminous suprarenal. She had been markedly asthenic, dying in a syncopal attack with vomiting and persistent diarrhœa. Other cases show other combinations such as amenorrhœa, gynecomastia, adiposity, hypertrophied clitoris, hypertrichosis, masculine voice, muscular activity, nervous and agitated, even overactive. Others only show continued hypertension and secondary arteriosclerosis possibly with glycosuria. Some patients pass through a nervous agitated crisis with all signs of marked hypertension, approaching a manic episode.

The virile type are made up of those intensely masculine females with traces of beards and often with marked homosexual traits.

The third type consists of the "infant hercules" anomalies, who at the ages of from four to eleven years develop genital hair, beards, general hypertrichosis and markedly older skeletons. Sometimes the intelligence is precocious, again they are imbeciles.

Therapy.— Polyglandular opotherapy with careful analysis of each type may give relief in certain cases. The indications are slowly crystallizing but cannot be even summarized here. Consult Jelliffe and White, 'Diseases of the Nervous System' (1917); Sergent, 'Les Glandes Surrenales' (1917); Pende, 'Patologia dell apparato surrenale' (1909); Falta, 'The Ductless Glands' (1915); Gley, 'The Internal Secretions' (1917).

SMITH ELY JELLIFFE.

ADRETS, Baron des, dā'zą'drā', **Francis de Beaumont:** b. Dauphiné 1513; d. 1587; a violent French Huguenot, who distinguished himself by many daring exploits as well as cruelties. From 1562 on he made himself noted for a ferocity matching his opponents, but seemingly from no religious motive. He subsequently became a Catholic, but died as he had lived, in general detestation. At some places he obliged his prisoners to throw themselves from the battlements upon the pikes of his soldiers. Reproaching one for retreating twice from the fatal leap, "Sir," replied the man, "I defy you, with all your bravery, to take it in three." This keen rejoinder saved his life.

ADRIA, ā'drē-ą, Italy, in the province of Rovigo, between the Po and Adige, is one of the oldest cities in Europe, having been founded by the Etruscans. So late as the 12th century A.D. it was a flourishing harbor on the Adriatic Sea, to which it gave name; but by the continual deposition of alluvium on the east coast of Italy it has been gradually separated from the sea, from which it is now 15 miles distant. It still retains several interesting remains of Etruscan and Roman antiquity, with a fine cathedral. It has a considerable trade in cattle, grain and wine, silk, linen, leather and pottery. Pop. about 18,000.

ADRIA, an abbreviated name of the Adriatic Sea. It is used by Milton in 'Paradise Lost.'

ADRIAN, Emperor. See HADRIAN.

ADRIAN I, Pope, b. Rome; succeeded Stephen III in 772; d. 795. Like his predecessor, he had to struggle against the power of the Longobards, who had invaded the Exarchate and other provinces bestowed by Pepin, King of the Franks, on the Roman see. Adrian applied to Charlemagne for assistance against Desiderius, King of the Longobards, Charlemagne crossed the Alps, defeated Desiderius and overthrew the Longobard kingdom in 774; he then went to Rome, where Adrian acknowledged him as King of Italy, and the latter renewed Pepin's grant. Charlemagne paid another visit to Adrian at Rome in 787, when his son Pepin was christened by the Pope. In 787 the 7th General Council of the Church was held at Nicæa. Adrian died after a pontificate of nearly 24 years. He was a man of talent and dexterity; he succeeded in gaining and preserving the friendship of the greatest sovereign of his time and saved Rome from the last barbarian invaders of the Western Empire. He was the first Pope to change his name on election.

ADRIAN II: b. Rome; succeeded Nicholas I 867; d. 872. He had been married and had a daughter by his wife Stephania, from whom he afterward separated in order to live in

celibacy. During his pontificate Photius, Patriarch of Constantinople, withdrew from the Church of Rome; from which time dates the schism between the Greek and Latin Churches. He was succeeded by John VIII.

ADRIAN III: b. Rome; succeeded Marinus 884 and died the following year.

ADRIAN IV, the only Englishman ever raised to the papacy; succeeded Anastasius IV, 1154; d. 1 Sept. 1159. He was Nicholas Brakespeare, and for some time filled a mean situation in the monastery of St. Albans. Being refused the habit in that house, he went to France and became a clerk in the monastery of St. Rufus, of which he was afterward chosen abbot. Eugenius III created him cardinal in 1146, and in 1148 made him legate to Denmark and Norway, which he converted to Christianity. As Pope he granted to Henry II a bull for the conquest of Ireland. In 1155 he excommunicated the King of Sicily; and about the same time the Emperor Frederick II, meeting him on a journey, held his stirrup while he mounted his horse. Adrian took the Emperor with him and consecrated him King of the Romans in St. Peter's Church. The next year the King of Sicily submitted and was absolved. His term was stormy; the Romans, influenced by Arnold of Brescia (whom he put to death), opposed him; his high claims for the papacy opened the long struggle with the Hohenstaufen house; and he was about to excommunicate Frederick II when he died. He was succeeded by Alexander III.

ADRIAN V, a Genoese, succeeded Innocent in 1276, and died five weeks after his election. He was succeeded by John XX.

ADRIAN VI, succeeded Leo X 1522; d. 1525. He was born at Utrecht, of an obscure family, advanced himself by his talents to the post of vice-chancellor of the University of Louvain. Ferdinand of Spain gave him the bishopric of Tortosa. After Fedinand's death he was coregent of Spain with Cardinal Ximenes. He was elected Pope chiefly through the influence of Charles V, whose authority was then spreading over Italy. He was succeeded by Clement VII.

ADRIAN, Mich., city and county-seat of Lenawee County; on the Raisin River, and on the N. Y. C., the Wabash and the Detroit, T. and I. railroads, 33 miles west of Toledo, Ohio, and 60 miles southwest of Detroit It is situated in the midst of a prosperous agricultural section and is fast becoming an important manufacturing centre owing to its favorable location and railway advantages. Among the chief industries are wire-fence plants, condensed milk plant, steel and iron casting foundry; and manufactories of cotton knitted underwear, screens for doors and windows, electric bells and horns, pianos, organs, leather, rockers, razor strops, concrete products, steel posts and rural mail boxes, baskets, gloves, mittens and toothpicks. Tomato preserving and tomato seed growing are also important industries with headquarters at Adrian. The United States Census of 1914 reported 68 manufacturing establishments on a factory basis employing 1,506 persons of whom 1,256 were wage earners, and a combined capital of $5,032,000. The annual value of the products amounts to $5,442,000. There are five banks with a combined capital and earnings of $737,298 and deposits of $4,805,834. The city has a fine system of public schools with 2,500 pupils and is the seat of Adrian College (q.v.); St. Joseph's Academy for Girls (Catholic) with 500 pupils; a good business college, and the State Industrial Home for Girls. There are many fine churches, a Y. M. C. A. building, a new post office, a public library with 23,264 volumes. Streets shaded with maple trees and lighted with electricity and handsome private residences make Adrian an attractive home city. It was founded in 1825 by Addison J. Comstock, incorporated as a village in 1828 and chartered as a city in 1853. The government is the commission form with a mayor and two commissioners. The city has a good sewerage system, water works, public steam heating and an electric street car line, and is connected by an interurban line with Toledo. Pop. (1910) 10,763; (1917) 12,000.

ADRIAN, Bull of (1156), issued by Pope Adrian IV (q.v.), granting the sovereignty of Ireland to Henry II in return for his undertaking to support the papal authority and to pay Peter's Pence.

AD VALOREM DUTY, a tax or duty the amount of which is not fixed, but is calculated at a rate of so much per cent on the value of the article imported.

ADRIAN COLLEGE, Michigan, located at Adrian, county-seat of Lenawee County, a Methodist Protestant coeducational institution, one of the oldest in the United States, organized at Leoni, Mich., in 1852, and in 1859 transferred under a new charter to Adrian. The college grounds cover 22 acres with five large collegiate buildings on the campus. The departments of instruction comprise: College of literature, science and arts; school of theology; commercial school; school of domestic science; school of fine arts; conservatory of music. The college library contains over 10,000 valuable reference works. The conservatory of music is equipped with a superior modern $20,000 four-manual pipe organ. From the time of its organization the college has maintained a reputation for thorough work as one of the best educational institutions in the country and with its facilities continually improved and kept abreast of the times, presents advantages for securing thorough scholarship, superior to those of any previous period. Special advantages are offered to the children of Methodist Protestant ministers and to candidates for the Methodist Protestant ministry. The average annual enrolment of students is over 200.

ADRIAN DE CASTELLO (ADRIANO DI CASTELO, ädrē-ä'nō dē käs-tel'ō), Italian cardinal and scholar: b. Corneto, Tuscany, c. 1460; d. 1521. He was educated at Rome; sent by Innocent VIII to England, and to Scotland and reconciled James III to his subjects; after that monarch's death at Sauchieburn he remained in England, and obtained a prebend and rectory from Henry VII. After Innocent's death in 1492 he returned to Rome and became prothonotary or secretary to Alexander VI (Borgia), and finally cardinal just before Alexander's death in 1503. The story that Alexander fell a victim to his own attempt to poison Adrian in order to inherit his great fortune is

scouted by recent historians. In 1502, in his absence, Henry VII made him bishop of Hereford, and in 1505 bishop of Bath and Wells. In 1517 he was involved in the plot of Cardinals Petrucci, De Sauli and Riario to poison Leo X, confessed, and was absolved on condition of paying 25,000 ducats, though deprived of his cardinalate and English dignities. He fled from Rome, however, lived in retirement till Leo's death in 1521 (probably in Venice), and died suddenly on his way back to Rome, there being a suspicion that he was murdered by a servant. He is honorably remembered as one of the first who sought to rescue Latin from its mediæval corruptions and restore it to purity. He wrote a religious treatise 'De Vera Philosophia' (The True Philosophy, 1507, printed Cologne 1548); 'De Sermone Latino et Modo Latine Loquendi' (The Latin Speech and Mode of Speaking Latin, a scholarly work published at Rome in 1515, and repeatedly since).

ADRIANOPLE ("Hadrian's city"), Turkey: its third city in size, next after Constantinople and Salonica; 137 miles west northwest of Constantinople, connected by rail; near the western end of the great Thracian coast-plain where it rises to the Rhodope mountains; at the confluence of the large Martiza (ancient Hebrus) which drains the centre of South Bulgaria, the Tunja from the north, and the Arda from the west, all navigable. This position and the convergence of several trade routes have made it from very old times a place of great importance. It was an antique Thracian city, rebuilt by the Emperor Hadrian, seized by the Turks under Amurath (Murad) I in 1361, and the residence of the Sultans thence till the capture of Constantinople in 1453. Since the Russo-Turkish war of 1877–78 and the separation of Bulgaria, it has lost nearly half its population and a large part of its trade. The old wall that once surrounded it, now existent only in a few fragments, has been replaced by a circle of modern forts. It has a palace and two fine bazaars, besides schools and mosques. Pop. about 83,000, half Turks and the remainder Bulgarians, Greeks, Armenians and Jews.

It has great historic interest as the scene of four events of the first importance. (1) The battle of Adrianople, 9 Aug. 378, A.D., the most tremendous disaster to the Roman arms since Cannæ, and incomparably greater in permanent effects. The Goths, whose head chief was Fritigern,— a man of superior genius and honorable character,— were being crowded southward by the great movement of the Huns which culminated in Attila's occupancy of all central Europe three generations later, and asked leave to settle in the lands south of the Danube they had ravaged into semi-desolation. This was granted on condition that they came unarmed and left the children of the leading families in Roman hands as hostages; but when the Goths complied, the imperial officers, who were to supply them with food, forced them to pay famine prices for it, and sold or kept many of the girls for concubines. The enraged Goths, in return, carried fire, sword and plunder far down into Thrace; driven back for a time, they returned in the spring of 378, reinforced by Huns and Alans, and their vanguard came near Constantinople. The Emperor Valens was an incompetent but ambitious man. Jealous of his brilliant nephew, Gratian, who had just won a great victory over the Western barbarians, and eager to fight before Gratian could join him and have the credit of a fresh victory, he made a long march on a sultry day and attacked the Goths with his fatigued troops. The Alan and Sarmatian cavalry surrounded and hemmed in the Roman infantry, like Hannibal at Cannæ, till they could not use their weapons; thousands were driven into a marsh; the Roman army was practically exterminated; Valens was never again seen alive, and the Goths obtained permanent possession of the broad plains south of the Danube. (2) The Treaty of Adrianople, 1829. In the Russo-Turkish war of 1828–29, Diebitsch passed the Balkans, advanced on Constantinople, and halting at Adrianople made the demands of a conqueror, and the panic-stricken Turks acceded to everything. Russia received the northeast coast of the Black Sea, and all rights over the Caucasus tribes, the district of Akhaltsikh, and the protectorate over Moldavia and Wallachia (now Rumania); and Turkey recognized the independence of Greece. (3) The Treaty of San Stefano (q.v.), after the capture of Osman's army defending Shipka Pass in the war of 1877–78. (4) During the war of 1912–13, Adrianople after a siege of five months capitulated and was ceded to the Bulgarians 30 May 1913 by the Treaty of London. The Turks reoccupied the city on 20 July 1913, and the reoccupation was confirmed 29 Sept. 1913, by the Treaty of Constantinople. From 1914, in the European War, Adrianople suffered from the ravages of enemy warplanes. See WAR, EUROPEAN.

ADRIATIC SEA, ā'drī-ăt'ĭk, or **GULF OF VENICE** (ancient Mare Adriaticum), an arm of the Mediterranean, stretching in a northwestern direction from the Straits of Otranto, between the east coast of the Italian Peninsula, and the west coasts of Turkey, Dalmatia and Illyria; length, about 480 miles; average breadth, about 100 miles; area, estimated at about 60,000 square miles. Its depth in the north, between Istria and Venice, is only from 12 to 20 fathoms, but increases in proceeding south to 100 fathoms near its centre, and to 500 fathoms between its centre and its entrance. At the straits between Otranto and Valona its depth does not exceed 350 fathoms, but increases very rapidly toward the Ionian Sea. Its opposite shores present a striking contrast, the east being generally bold and rocky, lined with islands and furnished with good harbors, but thinly peopled and comparatively sterile; while the west are low, shallow, marshy and ill provided with harbors, though generally populous and fertile. The Adriatic is evidently a continuation of the longitudinal valley of the Po, forming a long and narrow trough between the parallel ranges of the Apennines and the mountains of Illyria. The rivers which it receives, particularly the Po, its principal feeder, have produced, and are still producing, great geological changes in its basin by their alluvial deposits. Hence Adria, between the Po and the Adige, which gives the sea its name, though once a flourishing seaport, is now 15 miles inland. The principal trading ports on the Italian side are Brindisi, Bari, Ancona and Venice; on the opposite side, Ragusa, Fiume, Pirano, Pola

and Trieste. From July 1915, the Adriatic Sea was the scene of great naval activity between Italy and Austria. See WAR, EUROPEAN.

ADSORPTION (a variation of the word "absorption"). The condensation of a gas or vapor upon the surface of a solid. The fact that solid bodies are capable of condensing upon their surfaces air films or gas films of considerable density was probably first forced upon the attention of the physicist by the difficulty of obtaining a permanently good vacuum. Thus it was found that a glass globe (for example) might be highly exhausted, and yet after a time the vacuum would be found to be materially reduced, even when it was apparently impossible that any air should have leaked in from without. It is now known that unless special pains are taken to prevent it, a film of air remains condensed against the surface of the glass, even when the vacuum through the general bulk of the globe is very high; and air molecules from this film are gradually given off until the vacuum becomes much less perfect than it was at first. To prevent this action it is customary to heat the vessel that is being exhausted, as the gas film is largely driven off from the walls of the vessel when they are heated. See VACUUM.

The condensation of gaseous films upon the surfaces of solids is undoubtedly due to the molecular attraction exerted by the solid upon the gas. This molecular attraction is insensible at distances that are easily measurable, but it may be very great at points sufficiently near to the surface of the solid. The expression "sensible molecular attraction," which is in use among physicists, is indefinite, and no very precise statement can be made with regard to the limiting distance beyond which the attraction is not sensible; but from the investigations of Quincke, Plateau, Maxwell, Kelvin and others, we may infer, in a general way, that molecular attraction is not sensible at a greater distance than about 1-200,000th of an inch. Hence it is safe to say that this is the maximum thickness that the gas film condensed on a solid surface can have.

Concerning the condition of the gas in the film we can only say that where it is in immediate contact with the solid it probably has a very great density, this density rapidly falling off as we pass away from the solid. Under ordinary conditions of temperature the air film condensed against a solid cannot actually be in the liquid state, because it is not possible for air to exist in this state at any temperature higher than 220° below zero F. See CRITICAL POINT.

It is well known that a solid body appears to weigh less when it has been recently heated, or is still hot, than it does when it has been allowed to stand for some time in contact with the air at ordinary temperatures. This phenomenon is apparently due, to a considerable extent, to variations in the thickness of the film of air and moisture that the body condenses upon its surface. In accurate thermometry (see THERMOMETER), where the gas thermometer is used at a standard, great pains are taken, in filling the thermometer bulb with gas, to avoid the contamination of the thermometric gas by moisture condensed upon the surface of the bulb; the bulb being repeatedly exhausted, heated and refilled, until there is no longer the smallest chance of any appreciable part of the original surface film remaining. The phenomena of adsorption have not yet been fully studied.

ADULLAM, Palestine, a town in the Shephelah or southwestern Judean coast-land; the centre of a Canaanitish clan later fused with Judahite Hebrews, but not till after David's time, when it was still "outside Judah," for which reason he and his 400 freebooters took refuge in its "stronghold" (not "cave," a misreading which has led to many fruitless identifications of site and a familiar English nickname — see below) when outlawed by Saul (1 Sam. xxii). He also dwelt there when at war with the Philistines. Rehoboam fortified it. In Judas Maccabæus' time it was in "Idumæa," as he stopped there when he raided that territory.

ADULLAMITES, in English history, the Liberals who left their party in 1866 and joined the Conservatives, to oppose extension of the franchise by Mr. Gladstone and Earl Russell. John Bright in a speech compared them to the outlaws in the Cave of Adullam; to which Lord Elcho retorted that the band was hourly increasing, and would deliver the Parliament from the tyranny of Saul (Gladstone) and his armorbearer (Bright). The group was also known as "The Cave."

ADULT EDUCATION. See EDUCATION, ADULT.

ADULTERATION ("making otherwise"), in its legal sense the deceiving of buyers of goods as to their quality by secretly adding or taking away basic constituents. The element of deception must be present; openly selling any mixture, however poor, is not adulteration legally or morally. In current usage the term is restricted to food products, drugs and dyestuffs. The adulteration of coinage is termed "counterfeiting" (q.v.) that of unsound meat, fish, etc., "doctoring," a term which, with "sophistication," is also used for wines and liquors. Adulterated woolen fabrics are colloquially but not always properly known as "shoddy." The object of adulteration is to gain more profit: with costly wares, either by diluting them with cheaper ones, or by removing some valuable element for separate sale; with cheap ones, to make them look like or have the flavor of costlier ones; with spoiled or damaged ones, to make them appear sound. Most adulterations are not directly injurious to health, the public being cheated rather than poisoned, and it is to some extent a copartner in the deception, as the cost of wholly pure articles would greatly curtail buying. On the other hand, it is often forced into such copartnership by inability to find or know the good when willing to pay for it, and wastes money by paying for a pure article and receiving an adulterated one. And as the reduction of the nutritive value of food is itself a great evil; as the extent or harmfulness of adulterations cannot be known offhand and tends always to grow worse as the maker grows greedier and his character deteriorates from losing his self-respect (itself a great social evil); as honest dealers are not only prejudiced by unfair competition, and suspected of fraud when qualities are poor, but often driven into the

same course in self-defense; and as hasty additions of cheap materials are always liable to come from diseased sources and menace public safety,— modern legislation constantly broadens its scope in dealing with this offense alike from a pecuniary, a sanitary and a moral standpoint. Ignorance is not considered a valid excuse to a dealer who sells adulterated wares under the ordinary trade title; the offense is a fraud at common law, and he may be compelled to take back the goods or pay damages.

The history of adulteration would probably be coexistent with that of trade. We know that it was practised by the Greeks and Romans, and the comic dramatists have diverting references to the "doctoring" of stale fish. English statutes exist from 1266 with penalties for debasing beer or wine and selling inferior bread or meat, while tea (see below) had later a special statute; and the law-makers have never ceased struggling with the problem. But the first great general agitation was in 1851, when the London *Lancet* aroused the public by a special investigation, publishing analyses and names of dealers; and the first parliamentary commission was appointed. The first general adulteration act was passed in 1860.

The chief articles subject to adulteration have been, first of course, the great staples of life, flour and bread, milk, butter and cheese, with beer, wines, liquors and tobacco, staple in use if not need; relishes and seasonings, as sugar, honey, preserves, vinegar, pickles, condiments and spices; oil and lard; tea, coffee, cocoa and chocolate; confectionery; drugs and dyestuffs. The selection and extent of adulterations vary indefinitely with place and time; as cost or popular wealth differs in different countries and epochs, adulterations common in one place or generation are almost unknown in another.

Beer.— The objects of its adulteration are three: To give artificial strength to weak beer, to disguise the badness of poor or spoiled beer and to keep it from spoiling. The most common adulteration is the substitution of quassia, gentian, aloes or other bitter extract for the bitter principle of hops. Capsicum is added to give pungency and flaxseed and glucose to give the body which should be derived from malt. Carbonic acid gas is forced into imitation beer to give it "life." Alum, potash, cream of tartar and salt, used to make beer keep, are not regarded as deleterious adulterants. Salicylic acid is the preservative most commonly used, and benzoic acid and sulphites perhaps as frequently. Formaldehyde is also a frequent addition. A common practice is to fumigate beer casks with sulphurous acid gas and the beer afterward put into the casks takes up enough of the acid to preserve it. Wild cherries, various herbs and foliages, etc., are employed to improve a poor flavor. They are cheats but not injurious.

Butter.— A formidable list may be made of butter adulterants at different times and places,—chalk, gypsum, alum and borax, boracic and salicylic acids, glucose, flour, etc.; but for practical purposes they may be reduced to water, buttermilk, cheese, salt and oleomargarine (q.v.) as increasers of bulk, with arnotto, aniline yellow, etc., to improve the color. The latter is hardly adulteration either in bad intent or bad effect; the public universally connects a yellow tint with richness in cream,— quite irrationally, as the milk of many cows gives butter as white as tallow, yet of perfect quality and taste,— and the harmless pigments merely remove incorrect prejudices. The first four others are equally innocuous (save that buttermilk makes it grow rancid more quickly; it is usually carelessness or incompetence rather than fraud) and are mere diluents. In normal butter, water should not exceed 12 per cent and salt 5 per cent. By adding certain chemicals to butter and churning them together the butter may be made to take up from 25 to 35 per cent of water and 10 per cent of salt. Oleomargarine is not even an inferior product in any respect; its nutritive value equals that of butter and it keeps better; and the severity of the laws regulating its manufacture and inspection guarantee its quality beyond that of any other manufactured article. Its use as an adulterant is to be condemned chiefly on the ground of fraud in selling oleomargarine at butter prices. Glucose is sometimes found as an adulteration in butter to the amount of 10 per cent. The chemical preservatives deemed adulterants in butter are borax and boric acid chiefly and rarely formaldehyde and salicylic and sulphurous acids.

Cheese.— English cheeses are practically not adulterated. Fancy foreign cheeses, as the Swiss, etc., often contain coloring matter and potato meal. American cheese is by law permitted to contain coloring matter and is required to contain "in its water-free substance not less than 50 per cent of milk fat." However, it is not forbidden to sell cheese with less than this proportion of milk fat provided it is sold as "skimmed cheese," a provision too commonly ignored. A frequent deception practiced is the substitution of some cheap fat in cheese for the natural butter fat of the milk skimmed before being made into cheese.

Cocoa and Chocolate.— The chief adulterants are starch and sugar; but they have also contained wheat and potato flour, sawdust, oils and fats and other things, with iron rust as coloring matter. Ground cocoa shells and arrowroot are common adulterants. The tests are for theobromine (the characteristic principle of the cacao bean), fat, starch, inorganic matter, etc.

Coffee.— Its usual adulterations are seeds (roasted peas, beans, etc.) or roots (chicory, dandelion, carrots, turnips, parsnips, etc.) with caramel to color their gray tint. All these are mere diluents; though there are some who actually prefer an admixture of chicory for its flavor though it gives black, bitter and muddy grounds. It and the roots may be easily detected by putting a little of the sample into a glass of water; each bit of chicory or other root will be soon the centre of a yellowish-brown cloud which will rapidly spread till the water is all colored. A more serious adulteration is made by adding "coffee pellets,"— imitation coffee beans made of roasted wheat, peas, and molasses — to bean coffee. These are not discovered by the usual purchaser and when ground disappear in the dust and chaff. Coloring matters are frequently used to make an inferior grade of raw coffee resemble a high-priced grade. There are also chemical tests for both tea and coffee, by determining

the amount of theine or caffeine, the percentage of matter soluble in water, treatment with hot mineral acids which increase the sugar in coffee but not in chicory, etc. The microscope, however, is the most effective detector of adulterations in coffee.

Confectionery.— The extreme cheapness of sugar has practically put an end to the adulteration of all but the very poorest grades of candies; and those mainly with the harmless terra alba, or pipe-clay, and paraffin wax. The term "sugar," however, in this use of it includes glucose or corn syrup, permitted by law to be used in food products. A wide range of coal-tar colors are used but in such minute quantities as to be considered harmless.

Distilled Liquors.— Whisky, brandy and rum are often purely factitious, being made from caramel and dilute alcohol and given the characteristic flavors by ethers of various sorts and fusel oil (often left in genuine whisky, etc., from carelessness or grudging the cost of purification, and recognizable by its nauseous smell when a little of it is evaporated in the hand). The more common adulterants are raisin syrup, prune juice and glucose, with creosote, cayenne pepper and "cognac oil" (made from cocoanuts) for flavoring.

Drugs.— The adulteration in each case is special, with some article looking like the genuine but inert. This is, of course, potential manslaughter wholesale, as each prescription made from such materials might cost a life. Unfortunately, a large part of the drugs are imported and the fraud is probably committed before they come to this country at all. Many of the adulterations of drugs, however, must be considered accidental; they consist of dirt upon roots insufficiently cleaned and twigs and stems included with valuable leaves and berries. There are also the more serious deteriorations from age or careless handling, which amount practically to adulteration. Among this latter class are especially articles in which the valued ingredients are essential oils, as in cinnamon, cloves, peppermint leaves, lavender flowers, etc. When not intelligently cared for these articles lose their active principles by evaporation.

In the line of chemicals many of these accidental adulterations exist and the labelling of such substances "C.P." (chemically pure) should never be taken at its face value but proved by rigid tests. At the same time it must be borne in mind that a failure to meet all the requirements of an arbitrary standard is not evidence of adulteration or deterioration. Standards are generally established with but one or two objects primarily in view and a condemned chemical may be entirely suited to another use.

Among intentional adulterations in this class may be mentioned as examples: Alcohol, with wood alcohol; beeswax, with starch and ceresin artificially colored; geranium oil, with gingergrass oil; glycerine, with glucose and cane sugar; linseed oil, with mineral oils; linseed meal, deprived of its natural oil which is "restored" with cheaper oils; phenacetine, with the cheaper acetanilid; Seidlitz powders, with Epsom and Glauber's salts; soaps, with starch, flour, mineral oils and excess of water; tea sweepings (for the manufacture of caffeine), with many sorts of leaves and dirt; turpentine, with kerosene, etc., etc. Many drugs in leaf and root form have had their active principles removed by distillation or solution and some powdered drugs show an admixture with flaxseed meal and variously tinted sawdust.

Dyestuffs.— These are very variously adulterated with cheaper dyes, determinable, if at all, by expert chemical examination.

Flour and Bread.— Flour is not much adulterated in the United States, though it is in Europe, where the masses are poorer. The chief admixture is ground gypsum or other minerals, which can be detected with the microscope; diluents but harmless. Wheat flour is too often adulterated with corn, rye flour with both corn and low grade wheat and buckwheat flour with all three. The chief illegitimate additions to bread are alum and sulphate of copper, to whiten it or correct sourness. Alum in baking-powder is not thought objectionable, the heat of baking converting the mixture into insoluble aluminum phosphate; and by itself its chief harm is in disguising any sourness of the bread. Copper sulphate is always dangerous. Both are tested by dissolving gelatine, laid for some hours on a sop of bread, in a wood-alcohol tincture of logwood with ammonium carbonate, which turns blue for alum and green for the copper salt.

Honey.— Strained honey, a costly article when pure, is often heavily adulterated with glucose syrup, invert-sugar, cane sugar, gelatine, etc. An educated taste is a better guide to these than any analysis, as that of native flower-fed honey is beyond counterfeiting; but chemical analysis can detect most of them. Formerly comb honey was regarded as necessarily pure but modern beekeepers have been able to feed their bees with glucose and cane-sugar syrup which the bees innocently store in the combs as readily as they do pure honey. The charge has been made by English chemists that American combs are often made of paraffine; this is most improbable as the profit would be extremely small; and a very simple test will decide it. The microscope will show pollen grains in the real wax and warm sulphuric acid will blacken beeswax but not paraffine.

Lard.— Hogs' lard is frequently adulterated with stearine, tallow and cottonseed oil; other vegetable oils such as peanut oil, corn oil and cocoanut oil are more rarely used. The worst adulteration is water, which is successfully incorporated with the lard under pressure and, of course, sold at the price of lard. A common commercial fraud is the selling of low-grade hog fat for "leaf lard," the choice layers of fat from certain tissues of the animal.

Milk.— The adulterations of milk are reducible to five: Diluting, skimming, replacing the skimmed cream with cheaper animal fats, coloring to give it the look of cream and adding preservatives or correctives to keep it from souring or to sweeten its taste when beginning to turn. Its use as the staff of life for children and invalids makes its purity one of the most exigent demands and its poor quality or innutritiousness a direct or promoting source of widespread disease and death. In some great cities pure milk is not attainable for the masses at any price within the means of ordinary workmen; the dairy districts within reach of the city by train, during any time it will keep sweet and not churn, cannot supply enough for

all and it is inevitably diluted with water and more or less of it treated with chemicals. This adulteration may be still further increased by skimming off of the cream to sell separately, heavily reducing its nutritive value Still worse, the water used in dilution is not likely to be free from the bacteria of disease (diphtheria, typhoid and scarlet-fever outbreaks have been repeatedly traced to this cause, sometimes merely from cooling leaky cans in the tainted water); from decaying animal or vegetable matter, or from the germs with which street dirt is laden. (The contamination from sores on cows kept in unsanitary conditions belongs to another subject). As to the effect of the adulterations: Skim-milk is a cheap and valuable food for blood-making protein, as evinced by the cheese made from it; but it should be sold as such, otherwise infants and invalids who need the milk fat may be injured. Other fats do not replace the characteristic and valuable qualities of the cream. Of the chemicals used to preserve milk for short periods, formaldehyde (also used for preserving other foods) is most commonly employed. One part of formaldehyde in 10,000 parts of milk will keep the milk sweet for five days. In this proportion it has not been proved injurious to infants. It is usually added in only half this proportion, preserving the milk for three days. It is urged against its use that it destroys beneficent bacteria in the milk. Borax, salt and carbonate of soda are also used; neither they nor the arnotto used to give the milk a cream color are harmful in themselves, but only as disguising the real quality of the milk sold. Benzoic acid and salicylic acid are also found by milk inspectors in some samples. Cane sugar, glucose, starch, gelatine and even chalk are used to bring up diluted milk to a density which will stand the lactometer test. In some instances this has been done by adding condensed skimmed milk and some oil.

The method of testing for dilution is by the lactometer to determine specific gravity, which is lowered by admixture of water; in exact reverse, it detects skimming (which increases specific gravity by removing the lighter cream) by showing normal specific gravity when looks and taste are inferior. Skimming is also inferred from increase in transparency, as indicated by the lactoscope; opaque normal milk needs thinning with a certain percentage of water before a dark object or black line drawn on a white surface will show through; the less water a given sample needs for this visibility, the less cream it contains. For more precise determination the chemist finds the amount of solids in a sample by evaporating a mixture of milk and newly-heated asbestos and weighing the residue; the amount of fats, by dissolving them out with ether from a measured strip of blotting paper and evaporating. Watering may often be detected by testing for nitrates, which milk does not contain and most water does, and contaminated water practically always. The detection of animal fats used to replace cream is not easy, though the butyrates have some individual qualities.

Mustard.— This is perhaps the most heavily and universally adulterated article in the market; only a small percentage of it is pure. For one harmless adulteration the public is responsible, as for butter-color and pickle-green; that of turmeric or coal-tar color to give it the bright yellow demanded by customers, while real mustard is very dull. But it is usually diluted with starch,— wheat, corn or rice,— millet, rape-seed, flaxseed, old turnip- or radish-seed, charlock (wild mustard) seed, cayenne pepper, corn-meal, gypsum and wheat-bran. The adulteration is so large in some samples of mustard-paste that salicylic acid is added to keep it from spoiling. For starch, easy tests are iodine, which turns it blue, and its thickening in boiling water; for mineral matter the chemist determines the amount of ash. For the others, though the microscope is useful, the best remedy is to pay for a known brand,— which indeed is best of all.

Olive Oil.— A large part of the so-called olive oil of the market is cottonseed, peanut or mustard oil or greatly mixed with it; probably the equal in quality and taste of the genuine (as it is indistinguishable), but a fraud in price through deception. The very finest quality of olive oil is rarely adulterated as the taste is easily impaired by even a slight admixture. Tests: Nitric acid turns olive oil from pale green to dark green within a few minutes. Should the color change to orange or brownish, some other oil is present.

Pickles and Canned Goods.— The public demand for bright green pickles has been gratified by boiling them in copper kettles with vinegar and some alum, the vinegar forming the highly poisonous acetate of copper with the kettle and coloring the pickles green by forming albuminate or leguminate of copper on the surface of the pickles. As only a minute proportion of the copper salt remains in the liquid the determination of its presence is a task for the analytical chemist. The same process is said to be gone through with peas; and even the copper salts directly added, which would be a basis for a criminal prosecution. The presence of metallic salts from the can results from the action of certain vegetable substances on the tin coating and upon the iron after the tin is dissolved. These substances are not necessarily acids, as canned pumpkin will show a much larger percentage of tin salts than does canned plums. These salts of tin have not been proved deleterious, and, besides, oxide of tin would make the canned food too nauseous to eat long before it reached even a medicinal proportion, and oxide of lead has not been found in any quantity. By far the greatest danger in canned foods is that due to carelessness in the canning process, resulting in the development of putrefactive ptomaines which have been the cause of many deaths.

Preserves, Jams, Jellies.— Gelatine and glue are often used to help the fruit to jelly (not always an easy thing to assure even by experts) and are often not restricted to the amount needed; the goods are also artificially colored and flavored with so-called "fruit oils," chemical analysis being needed to determine the constituents. The demand for cheap jams and jellies brings into the market concoctions of glucose and apple juice artificially flavored and colored to conform to the name on the labed on the jar. In some instances a little real fruit is scattered through the material. The

deception is self-evident, as every housewife knows the impossibility of making such goods at the price. Zinc oxide has been found in preserves, from its use as cement to make covers of jars airtight. Most of the cheap products contain the allowable percentage of benzoate of soda to prevent their decay. To make up for the lack of sweetness in the glucose saccharine is a frequent addition. The apple-pulp from cider-mills is a common basis of cheap jams and this is sometimes given body by the addition of boiled starch, agar-agar or dextrine. If in good condition none of these adulterations is injurious to health. The fraud is in the name under which they are sold.

Spices: Nutmeg, Pepper, Cinnamon, Mace, Cloves, Allspice, etc.— Whole spices are generally thought safe from adulteration; but they are not, as inferior members of the same species may be substituted for them with immense loss of quality, exactly as if crab-apples were sold for dessert apples. Thus, wild nutmegs are often sold for the cultivated ones and cassia almost always for cinnamon. The method of detection is to know the genuine. For instance, the best nutmegs are about an inch long and shaped like a damson plum, weigh one-seventh to one-fifth of an ounce and exude oil liberally when pricked with a pin; the wild ones are small and pointed and have less oil and fragrance. The genuine Ceylon cinnamon is a thin small roll, of delicate flavor which lasts long in the mouth, and tears rather than breaks; the cassia cinnamon is much coarser and thicker, breaks but does not tear, is rather mucilaginous when chewed and has a strong woody flavor. Cloves are adulterated by making them absorb water, of which they will take up a great deal to increase their weight. Another form of adulteration is the removal of a part of the essential oil and the subsequent sale of this exhausted spice at regular prices.

The immense adulteration of ground spices makes their convenience a costly purchase. At the outset, sawdust and starch are added even to the best, to absorb the oil which makes them difficult to grind; and it rarely stops there. Of 12 specimens called "ground cinnamon" examined by the New York Board of Health, only three contained any cinnamon whatever and even those were largely mixed with cassia and sawdust; the others were almost entirely composed of those ingredients, two were sawdust with a very little cassia and one was pure sawdust. Seventy per cent of the allspice, 70 per cent of the pepper, 82 per cent of the cinnamon, 57 per cent of the cassia, 76 per cent of the cloves, and 66 per cent of the ginger, was adulterated. The most universal adulterations are starch for bulk, mustard for pungency and turmeric for color. Other substances used are cocoanut shells, rice, charcoal, sand, ground date and olive stones, buckwheat hulls and the ground shells of walnuts, brazil nuts and almonds and corn meal. Ginger, like cloves, is often exhausted by removing its essential oil with alcohol or even by soaking in water to procure the "water extract" used in making ginger ale. Black pepper demands a special note, as it is the exception rather than the rule to find it pure. A large percentage of the samples examined in the past have contained no pepper at all. "Pepper dust" (the sweepings of warehouses, in trade a regular article of sale as "P. D."), mustard husks, ground wheat, corn or rice, capsicum, and even gypsum and sand, have been found in it. Red or cayenne pepper is much purer than black pepper and is mainly adulterated with flour, crackers, rice, turmeric, red ochre and coal-tar dyes. Ground mace often contains cracker dust tinted with Venetian red.

Sugar.— White cane sugar has become so cheap that it does not pay to adulterate it and the old-time adulterants like marble-dust, terra alba, etc., have practically disappeared except in cheap confectionery. Sand was never much used except in brown sugar (4 per cent has been said to be unavoidable in raw Manila sugars, but any percentage is indictable if the direct addition can be proved) and glucose has taken its place; equally healthful with cane sugar but, of course, a fraud, as lacking in sweetening power, and a deception.

Tea.— Owing to its cost and the difficulty of judging its quality by the eye or taste, tea has always been an article easily susceptible to adulteration since its introduction into the West; fortunately, more than most products, the price is an index of the quality and it is easy to procure a good article by paying for it. It has the distinction of having had a special law passed to prevent its adulteration, and for the most curious reason imaginable: the Act of 17 Geo. III alleges that the admixture of the leaves of sloe, ash, elder and other trees and shrubs with it was working great injury to the local timber and undergrowth. Being a luxury whose cost presses heavily on the very poor, its substitutes within the means of that class have usually none of the characteristic properties, good or bad, of the genuine and are mere flavored warm drinks; curiously, the poisonous adulteration alleged against it (groundlessly), that of obtaining its green color from copper pans, was against the very costliest brand of all. It has been found, however, that tea is "faced" with Prussian blue and indigo, soapstone, plumbago and gypsum. But the stuff sold to the poor, besides spent tea-leaves and those of various plants, as above, has been found to contain sheer dirt, sweepings, brick-dust, iron filings and iron salts, sand, etc., unwholesome and liable to contain disease germs. Catechu is sometimes added to give increased astringency. Owing to careful inspection very little tea in the American market is adulterated otherwise than by mixing a lower grade tea with a more expensive one and selling the mixture at the top price. See TEA.

Tobacco.— Color and flavor are often given to inferior grades by artificial means. No leaf is known which will counterfeit the tobacco leaf outright. Snuff, however, lends itself readily to debasement by colored powder, and lime and chromate of lead have been found in it.

Vinegar.— The most usual form of adulteration is thinning down with water, then restoring the lost acidity with sulphuric, muriatic, nitric or other cheap mineral acids. The first is easily detected by the considerable precipitate when barium chloride is added; the second by a white flocculent precipitate on adding a few drops of solution of silver nitrate. Nitric acid needs special chemical tests only to be performed by an expert. Imitation vinegars

are made by the acetic fermentation of malt sugar, cane sugar and alcohol, all diluted with water to a degree where the ferment will work. These vinegars, of course, derive their acidity from acetic acid. They lack the flavor of apple-juice. However, this is sometimes added, together with a proportion of pulp from the cider-mills, to counterfeit the body and taste of pure cider-vinegar.

Wines.— Naturally their chief adulterants are water and alcohol, to increase bulk or strength; colors and flavors, astringents, etc.— caramel, logwood, glycerine, syrups, etc.,— to give artificial qualities resembling wines of repute; salicylic acid to prevent souring; gypsum to precipitate organic matters that muddy the wine (the latter injurious as likely to turn into acid potassium sulphate); sugar in the must, to increase the alcohol, etc. Natural colors like fruit juices and cochineal are harmless; aniline colors not always. The chemical tests are too special to be detailed in a popular work. It should be said, however, that by far the leading adulteration consists in the wine not being real fermented grape-juice at all; this applies only to foreign wines, the American being generally pure and practically the only pure wines at moderate price on the market. Real wine from foreign vineyards is a costly article and the better grades are pledged years ahead to the great foreign courts, noble houses and private European buyers. Cheap foreign wines should be understood from the outset to be made either from exhausted grape-skins or raisins treated with alcohol and water (it is not for dessert use that the great majority of the California raisin crop is exported to France) or from pear-juice (much the greater part of the so-called French "champagne" in America being perry).

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ADULTERY, unlawful intercourse between two married persons not standing to each other in the relation of husband and wife, or between a married person and another unmarried. In the former case it has been called double and in the latter single adultery. Unlawful voluntary sexual intercourse between two persons, one of whom at least is married, is the essence of the crime in all cases. In general it is sufficient if either party is married and the crime of the married party will be adultery while that of the unmarried party will be fornication. In the United States there is a wide diversity in the laws relating to this offense. In some States it has been made a crime while in others civil proceedings are allowed substantially similar to those of the English law. Varied punishments, mostly of a very severe character, have in nearly all countries and ages been inflicted on those who have committed this offense. In some cases it has been deemed lawful for a husband or the woman's father to kill the guilty person if taken in the act. By the law of England the slaughter of the offending parties in such cases is deemed manslaughter of a not very aggravated sort. In English law the act is punishable only by the censure of the ecclesiastical courts, but when committed by a wife it is regarded as a civil injury and an action for criminal conversation may be brought by the husband against the paramour. Adultery is now considered in England a ground for total divorce.

ADVAITA, ä-dwAI'ta, a philosophical school of India, founded by Sankarûjûrya (or Cankarâcârya), who flourished about the middle of the 8th century A.D., or earlier. Its principal doctrines are that the human soul is not essentially different from God, but that it is imprisoned in the body from which at death it is released to return to the impersonal God and that the material world is not different from God. Its adherents are called Advaïtavâdin, or Confessors of Monism.

AD VALOREM ("according to value"), a term denoting the method by which customs taxes are determined at a percentage of the value of the imported article at its place of export on the seller's oath and appraiser's estimate. Theoretically, this is much fairer than a specific duty (on a unit of measure, as pound, yard, bushel, bale, etc.), since the costlier pay their equal percentage with the cheaper; but in practice it has serious drawbacks, annoys both sellers and government much, defrauds the latter somewhat and its people a great deal. Values are unstable, the exporter is interested to understate them and the officials are eager to scent fraud, whence much friction and many lawsuits. As to the last item, general tariffs are apt to produce an appearance of moderate average by equating a low duty on grades of slight consumption with a high one on those chiefly used; a deception impossible on specific duties, which at least must declare themselves. The customs officers much prefer these also. The United States tariffs are of both kinds, some articles having a combination of the two. See DUTY.

ADVANCE GUARDS. The principal detachment insuring security for the command in the field, which covers the head and flanks of a column or army advancing in the direction of the enemy. For a large force the advance guard is necessarily composed of troops of all arms; its strength being proportioned to that of the main force; the more or less resistance of an independent character it may be required to make; and the greater or less extent it may be found necessary to embrace by its advanced posts on the front and flanks to watch and anticipate every movement of the enemy. The proportion of the advance guard to the main body may vary from a third to a fifth of the total force. In armies of some strength, or large *corps d'armée,* particularly where the nature of the country requires a wide development of advanced posts, the larger proportion is demanded; as at least one-third or even one-half of its strength will be required for the advanced post service. In a small force of two or three thousand men one-fifth will usually be all that can be well spared for the same

purposes. The purpose in all cases should be to keep the enemy in a state of uncertainty and even to act offensively against him when occasion offers so as to keep him in doubt as to the actual character and numbers of troops before him. In all defective positions the advance guard and its advanced posts should retire slowly, but circumspectly, so that the main body may have time to take all its defensive measures. In the offensive the attack of the advance guard should be decided and vigorous; pressing upon the enemy at every point; and leaving nothing undone to demoralize him by the confusion which so often follows from an impetuous onset. In all affairs of advance guards great circumspection is to be shown both by the officer in command of the advance guard in throwing forward fresh troops to strengthen a point assailed, as well as on the part of the general-in-chief in sustaining the advance guard by weakening his main body. These are points that can only be decided on the spot. The safer rule in all cases is not to weaken the main defense, or main attack, by detaching from it to support a feeble point. If the force engaged under such circumstances does not suffice for its own defense it is best for it to fall back in time and, taking position with the main body, endeavor, by their combined efforts, to turn the scales of victory in their favor.

Strength.— The strength of an advance guard depends upon: (1) The force it is covering. (2) The object for which it is organized. If its commander is instructed to engage the enemy whenever found, its strength should be at least one-fourth of the entire command. If, however, he is only to delay the enemy's advance to give the main body time to deploy, it should be as small as is consistent with this duty — for a large force, from one-sixth to one-eighth will suffice. (3) On the nature of the country. (4) The character of the enemy. (5) The distance it is required to precede the main body. Its strength should never exceed one-third of the command and rarely be diminished below one-sixth. The strength of advance guards would usually be as follows:

One battalion of infantry (four companies), one-half to one company;

One regiment of infantry (12 companies), two to three companies;

One brigade of infantry (36 companies), six to 10 companies.

In an infantry division, approximately the following number of troops would be detailed on advance-guard duty:

From the three brigades of infantry, two regiments;

From the two regiments of artillery, one battalion;

From the regiment of cavalry, two battalions;

From the one company of engineers, one-half company of engineers.

One of the important duties of the army commander is to determine the strength and composition of his advance guard and he must bear in mind many things in addition to those already mentioned. (1) If the enemy is near the duty will be arduous. (2) That detachments from the main body may impair its strength at a critical moment. (3) That an ambitious officer, finding himself in command of a strong force, may unwisely become involved with a stronger one and thus force his chief to deploy the main body to extricate his advance guard. He must also remember that the defensive powers of small bodies have been increased by improvements in fire-arms.

Duties.— The duties of the vanguard are: (1) To examine thoroughly the ground and remove all obstructions from the road. (2) To gain information of the enemy, especially when the cavalry division is not in advance. (3) To drive back or capture any detachments of the enemy they may find or hold the ground until they can receive reinforcements. As the principal duty of the vanguard is reconnoitering, it should be largely composed of cavalry. The duty of the reserve is to fight and it would naturally be composed of infantry and artillery.

The remainder of the unit from which the advance guard is taken ought, when convenient, to march at the head of the main body. The place for the commander of the advance guard is with the reserve. In open country the scouts and flanks should operate at considerable distances from the column and connecting files should be placed to insure rapid communication.

Cavalry.— Cavalry must lead the vanguard and furnish scouts and flankers when the country permits. It can move with great rapidity, can examine places at a distance and quickly regain its place without delaying the march. It must push forward boldly and keep well in advance. It must furnish the regular patrols and detachments to examine lateral roads. The rôle of the cavalry is reconnaissance, but as it may meet with obstacles to its progress, such as detachments of the enemy's infantry, villages, defiles and roads, it must be accompanied by infantry to which these duties must be assigned. The cavalry may ride around a village or small wood and examine the outside, but it should not enter until they have been explored by the infantry. While the infantry is engaged in the examination, cavalry patrols should be sent on the roads beyond on the lookout for the enemy. Defiles, ravines and rough country generally must be examined by the infantry. As all kinds of country are apt to be found in a day's march, the advance party and flankers must not be cavalry alone. It is impossible to give a general rule as to the proportions of the various arms.

Artillery.— The mobility and the offensive and defensive powers of modern field artillery have become so great that it is now assigned an important place in the advance guard in country favorable to its movements. As it must come into action early, some pieces are frequently attached to the support and the remainder of the battery or batteries march with the reserve. A division would have one battery with the advance guard, two pieces to march at the rear of the support and the other pieces behind the first battalion of the reserve. The limber-chests should be filled with ammunition and the caissons be left in the rear out of the way. It can assist in dislodging the enemy from villages, buildings, woods and bridgeheads.

The battles of the future will generally be preceded by a concentration similar to that of

the German armies, at least for the corps of the first line. There is nothing to prevent placing the corps artillery in the advance guard if the situation is strong and well known. No inconvenience will result, for when this artillery is called to participate in the combat it will take the trot and leave vacant the interval between the advance guard and the main body for the zone of manœuvre. In immediate contact with the enemy the advance guard must form a curtain of exploration with its skirmishers and advanced parties while the main line of resistance must be formed from the reserve. The masses will march in the rear of the advance guard. The disposition will depend upon the ground and the intentions of the chief — the important thing is that the artillery find the ground free in its front. The artillery has also a reconnaissance rôle in connection with the cavalry for, with its long range, it can assist in searching by its fire places unapproachable to the cavalry.

Infantry.—The rôle of resistance belongs to the infantry, as it is essentially the fighting arm in the combination. Its mobility imposes upon it also the duty of assisting the cavalry in reconnaissance work and of covering the artillery. The more artillery in the advance guard the more infantry it must have. In rough country the service of exploration and the advance guard duty will fall almost entirely upon the infantry. In the combat with the enemy's advance guard the infantry must advance quickly to protect it from the enemy's infantry fire. We may say that all of the duties, which from the nature of their organization the cavalry and artillery cannot perform, fall to the lot of the infantry. Its rôle is "to conquer and to preserve."

A light bridge train and some engineer troops should also be assigned to the advance guard to bridge streams, destroy obstacles and repair roads for the progress of the main body.

The Commander.— When the enemy is near, the selection of a commander for the advance guard is very important. He must combine boldness, activity and knowledge with good judgment, and be so well disciplined as to subordinate his actions to carrying out the wishes and instructions of the commander-in-chief, and avoid bringing on engagements through his own desire for distinction. He is responsible for the proper arrangement of the various parts, and that each faithfully performs its particular function. He must see that information obtained as to the strength, position or movements of the enemy is promptly and accurately transmitted to the commander-in-chief. Before assuming command of the advance guard, he reports to his chief for instructions. If they are verbal, he should write them in his notebook and have them verified. He should quickly inspect his command, divide it into the proper parties and give his subordinate chiefs their general instructions before the march is begun. If attacked, he must do one of three things, viz.: (1) Move forward and drive the enemy from his position. (2) Assume a defensive position and hold it until he can be reinforced from the main body. (3) Or, if outnumbered, retire slowly on the main body, using every device to check the progress of the enemy until the main body can be formed. See FLANK GUARDS, REAR GUARDS and VANGUARD.

ADVANCED POSTS. Positions taken up by a force in advance of the main body of an army, and in such a situation that they shall be within easy communication of it and of one another. The duties of the advanced posts are the same whether the troops are stationary or in movement. They are: (1) To keep a lookout for the enemy and when in his immediate presence to take all means accurately to be informed of his strength, position and movements. (2) Should the enemy advance, to hold him in check long enough to give the main body ample time to be prepared for his attack. By a faithful discharge of these duties the whole army can, at all times and under all circumstances, be kept in a state of readiness for action without subjecting the soldiers to any fatigue beyond the ordinary physical endurance of a well-developed manhood; as but a small portion, comparatively, of the force present is required to watch over the safety of the rest, and can therefore be frequently relieved, so that every one may have time sufficient for the repose demanded after extraordinary exertions. The object being to secure the front and flanks of the position occupied by the main body from any attempt either to reconnoitre or attack it, the detachments which form the advanced posts must be so distributed as to embrace all the avenues by which the enemy can approach the position. The system adopted, in most services, to effect this object consists of two or three concentric lines of posts, disposed in a *fan-shaped order*. The exterior line, which forms the *outposts*, embraces a wide circumference, and by means of a chain of *sentinels*, posted in advance, prevents any one from penetrating to the rear between the posts without being seen. The second line, which is one of *grand guards*, embraces a narrower circumference than the line of outposts, occupying the more important avenues from the outposts to the interior, so as to be in a position to support the outposts in case of necessity, and to receive them if driven in. The interior line consists of several strong detachments, termed *pickets*, posted upon the main avenues to the position. They serve as supports to the two exterior lines, upon which they rally if forced to retire before the enemy. Besides these dispositions for security, *patrols* are kept up between the line of posts, to keep the one informed of the state of the other; and also between the outposts and chain of sentinels, to see that the duties of the latter are well performed and to search any ground not brought well under the eyes of the sentinels. The whole, in this way, forms a connected system for observing the enemy and for mutual support in case of attack. The ground taken up by the advanced posts will depend on the capabilities which its natural features offer for defense; on the number and character of the approaches it presents to an enemy for attacking the front or flanks of the position occupied by the main body; and upon the facilities it may afford for communication between the posts.

ADVANCEMENT, in law, is a gift by anticipation from a parent to a child of the whole or a part of what it is supposed such

child would inherit on the death of the parent. An advancement can only be made by a parent to a child (2 Jones 137), or in some States by statute to a grandchild (4 Kent Comm. 419). The effect of an advancement is to reduce the distributive share of the child by the amount so received, estimating its value at the time of receipt. In some States, however, the child has his option to retain the advancement and abandon his distributive share.

ADVANCEMENT OF LEARNING, The, by Francis Bacon, 1605, the original title being 'Of the Proficience and Advancement of Learning, Divine and Human.' This book, received with great favor by the court and by scholars, was afterward enlarged and published in Latin with the title 'De Augmentis Scientiarum,' as the first part of a monumental labor, 'The Instauration of the Sciences,' of which the second part was the still famous 'Novum Organum,' on which Bacon's fame as a philosopher rests.

ADVENT, the period of some weeks before the Nativity, observed in all the apostolic churches as a season of solemnity of emotion and action, marriages and public amusements being interdicted or reprobated; in the Roman Catholic Church also a season of fasting and penance. In the Western Churches — Roman, Lutheran, English and Protestant Episcopal — it is of four weeks, beginning the Sunday next after 26 November, or that nearest St. Andrew's Day (30 November); in the Greek Church it is six weeks, beginning 11 November, St. Martin's Day. Our first notice of it is in the 6th century, at the Synod of Lerida (524); and two sermons on it in 542 show that it was then in general observance. In that century also the Eastern and Western Churches, following the Nestorians, made it the beginning of the ecclesiastical year instead of Easter. Its four Sundays were believed to have been introduced into the calendar by Gregory the Great; and to have reference to Christ's fourfold coming early spoken of — in the flesh, at the hour of death to his faithful followers, at the fall of Jerusalem and at the day of judgment. On these grounds the gospels were chosen for the four Sundays. Its ordering was settled in the Western Church by Charlemagne's "Homilarium."

ADVENT, Second. See MILLENNIUM.

ADVENTISTS. Bodies of believers who take their name from their belief as to the second coming of Christ. They came out of the movement begun by William Miller, a Baptist of New England, who, after a long study of the Scriptures, especially of the prophecies, reached the conclusion that the second coming of Christ would take place in 1843, at which time Christ would personally descend to earth and reign with the saints a thousand years. He based this prediction on the prophecies of the book of Daniel, holding that the periods spoken of as "2,300 days," "the seven times of Gentile supremacy," and the "1,335 days," were prophetic periods and, applied chronologically, led to the end of the world in 1843. He also interpreted the Gospels and the Apocalypse as showing that the "only millennium" to be expected "is the thousand years which are to intervene between the first resurrection and that of the rest of the dead." He confessed his disappointment at the failure of his prediction and admitted his error; but insisted that the day of the Lord was at hand. Miller drew many followers from the Baptist, Christian, Methodist and other churches, and the discussion was attended with considerable excitement. He fixed upon a second date, 22 Oct. 1844, after which many left the movement. Those who remained held a general conference in Albany, in April 1845, and set forth their belief in the personal proximate coming of Christ, without naming any dates, and in the resurrection of the saints at his appearance, the millennium to follow. Small companies of Adventists have since fixed upon various dates, but the body of believers have not supported these predictions.

Societies, or churches, were formed during the progress of the movement, but no very definite organization was at first attempted to bind these societies together. Organization came into use when differences of view began to divide Adventists. The Evangelical Adventists may be regarded as the oldest organized branch. Adventists baptize by immersion. The six bodies reported in 1916 a total of 112,054 church members, 2,794 churches and 1,501 ministers.

1. Evangelical Adventists.— These refused to accept the belief that the soul of the wicked is mortal. They announced the doctrine that the soul is immortal; that all the dead will be raised, the saints first and the wicked last; that the saints will participate in the millennial reign of Christ and after judgment enter upon their eternal reward; that the wicked who will rise at the end of the millennium will be sentenced to everlasting punishment. They also held that the dead are in a conscious state. They had in 1890 two annual conferences and about 1,147 church members. According to the census of 1906 they had decreased to 481 members, with eight ministers and 18 churches. As an organization they are now nearly extinct.

2. Advent Christians.— This branch, which has shown a tendency in recent years to closer organization and to increase, opposed the doctrines enunciated by the Evangelical branch in 1855 as to the conscious state of the dead and the resurrection of the wicked, holding that immortality is conditional and does not belong to the wicked who will be raised from the dead at the end of the millennium to receive sentence of banishment and annihilation, while those who accept Christ shall rise and receive the reward of eternal life, at his second coming, which they believe is near at hand and is to be personal and visible. They avoid any attempt at fixing a particular day for his coming.

The Advent Christians are congregational in polity; they have district conferences to the number of 50 or more (including six in Canada, England and China) which hold annual sessions; also a general conference, meeting biennially, composed of delegates elected by the district conferences. Its function is to serve as a means of co-operation in carrying on the missionary, educational, publishing and other work of the denomination. In 1916 there were 602 ordained ministers, 30,316 church members and 640 churches. The body is strongest in New England where it originated; but it also has churches in the West and South. Their headquarters are at 160 Warren Street, Boston, Mass.

3. Seventh-Day Adventists.— As early as 1845 a congregation in New Hampshire connected with the Advent movement began to observe the seventh day as the Sabbath, holding that the fourth commandment was still in force. Those Adventists who adopted this view gave a different interpretation of the prophecy of Daniel that at the end of the 2,300 days the sanctuary should be cleansed. They held that it did not refer to the renewal of the earth, as Miller had contended, but to the Sabbath, as ordered by the fourth principle of the code which was placed in the ark of the covenant, a type of the heavenly sanctuary. As the company of Seventh-Day observers grew they established a paper to advocate their views (1849) in Middletown, Conn. In 1885 the headquarters of the denomination were removed to Battle Creek, Mich., and in 1903 to Washington, D. C. The Seventh-Day people believe, with most of the other branches, that the second advent of Christ is to be personal, that it is near at hand, that it is to precede the millennium, at the end of which Christ and his followers will reign on the earth and Satan and all who do his work will be destroyed. Mrs. Ellen White, one of the founders of the denomination, was credited with divine revelations as a prophetess.

The body is thoroughly organized with local, State and union conferences and a general conference. The latter meets quadrennially, the union conferences, which embrace five or six States, meet biennially and the State and local conferences meet annually. The local churches have the congregational form of government, but the conferences are presbyterial in character. There are departments of missions, publication, medicine, education, Sabbath school and young people's work which are conducted systematically. The foreign mission work is quite extensive, embracing the countries of Europe, also including Iceland, China, Japan, Korea, India and Burma, five centres in Africa, Australia, Canada, Mexico and South America. The educational work includes 12 colleges, 23 academies, with numerous church and intermediate schools. A sanitarium was established at Battle Creek in 1866; now there are upward of three score institutions of this kind for the "rational treatment of disease" and inculcation of temperance and healthful living.

The denomination grows from year to year, reporting, in 1916, 77,724 members in the United States alone, with 2,036 churches and 558 ministers. It embraces all the States, but is strongest in the North Central group and in the Eastern.

4. Church of God.— This is a small body akin to the Seventh-Day branch, from which it sprang, but differs from it chiefly as to the prophecies of Mrs. Ellen White, which it refused to accept. On most other points they agree with the original denomination. The Church of God publishes a paper at Stanberry, Mo., called the *Bible Advocate*. There are in this branch 800 members, 22 churches and 34 ministers.

5. The Life and Advent Union, organized in 1864, holds that there will be no resurrection of the wicked dead. Eternal life will be given at the second coming to those who are to receive it and the millennium is not in the future, but in the past, and was a period of persecution and suffering for Christians. *The Herald of Life,* which represents this body, is published at Springfield, Mass. No statistics have been reported since the census of 1906 when there were 509 members, 12 churches and 12 ministers.

6. Churches of God in Christ Jesus, a small body of "Age-to-Come Adventists," organized in 1888 in Philadelphia, Pa. They hold that the capital city of the kingdom of God, which Christ will establish at his second coming, will be in Jerusalem, and the Israelitish nation will then be restored to the favor of God. Hence they are often called "restorationists," "restitutionists." Their organ is *The Restitution,* published at Plymouth, Ind. They have 2,224 members, 65 churches and 61 ministers.

Bibliography.— Consult for the general history of the Adventist Movement, Welcome's 'History of the Second Advent Message' (Yarmouth, Me., 1874); for the Seventh-Day branch, Loughborough's 'Rise and Progress of the Seventh-Day Adventists' (Battle Creek, Mich., 1892); for the Church of God, Dugger's 'Points of Difference between the Church of God and the Seventh-Day Adventists' (Stanberry, Mo.), and for the Age-to-Come Adventists, Weethee's 'The Coming Age' (Chicago, Ill., 1884). Also Carroll's 'Religious Forces of the United States' (rev. ed., 1912.

HENRY K. CARROLL.

ADVENTURES OF BARON MUNCHAUSEN, The. Munchausen's Adventures are a by-word among travelers' tales for extravagant, methodical lying. They owe their name and first inspiration to Hieronymus Karl Friedrich, Baron Münchhausen (1720–97), of Bodenwerder, near Hanover, Germany, who had served in the Russian cavalry against the Turks (1737–39) and had had an adventurous middle life. He had been living on his German estate since 1760 and was renowned locally as a raconteur. Among his auditors was a German scholar and writer, Rudolph Erich Raspe, who, being in straits in London in 1785, published anonymously some of these stories in a little book of 49 pages, 'Baron Munchausen's Narrative of His Marvelous Travels and Campaigns in Russia.' This with additions not by Raspe reappeared in 1786 as 'Gulliver Revived, the Singular Travels, Campaigns, Voyages and Sporting Adventures of Baron Munnikhouson.' A free German translation by the poet G. A. Bürger (1786) gave the book international popularity. Raspe had drawn his materials not only from the Baron's talk but from older sources, especially Bebel's 'Facetiæ' (1508) and Lange's 'Deliciæ' (1765). The English edition of 1793, with a sub-title, "or the Vice of Lying Properly Exposed," had further additions and such continued to be made by publishers' hacks for many years. The Baron, innocent source of all this, was far from relishing the reputation he had gained for unveracity by such pranks of a lively fancy as cold so bitter as to freeze music into a posthorn or thaws that would leave the rider after a night's rest to find his horse hanging by the bridle from a steeple. Adolph Ellisen, in a German edition of 1849, says his father found the Baron exceedingly uncommunicative

when he visited him in 1795. The most satisfactory modern English edition of the 'Adventures' is by Lawrence and Bullen, with an introduction by T. Seccombe. There are many others, some illustrated by talented artists. For the place of the 'Adventures' in the history of literary lying consult 'Diédeutschen Lügendichtungen bis auf Münchhausen' by Karl Müller-Fraureuth (1881) and Lienhard, F., 'Münchhausens Lustspiel' (Leipzig 1900).

BENJAMIN W. WELLS,
Author of 'Modern German Literature.'

ADVERB, a word joined to a verb, an adjective or another adverb, to qualify or modify the sense, as adjectives are joined to substantives. An adverb cannot be the subject, copula or the predicate of a proposition. They are divided into adverbs of place and direction, of time, of degree, of manner, of doubt, etc., according to their signification. Adverbs admit of comparison to the same degree as adjectives. In English a large class of adverbs is formed from adjectives by the addition of the syllable *ly*, which is derived from the word *like*. Phrases that can be represented by a single adverb or that fill the function of an adverb when there is no single equivalent to them are termed adverbial phrases.

ADVERSE POSSESSION, a possession against any other claimant. It is the enjoyment of land, or such estate as lies in grant, under such circumstances as indicate that such enjoyment has commenced and continued under an assertion or color of right on the part of the possessor. In a majority of the States of the Union, when such possession has been actual and has been adverse for 20 years, of which the jury are to judge from the circumstances, the law raises a presumption of a grant. This presumption, however, arises only when the use or occupation would otherwise have been unlawful. Such possession, however, must be open, notorious, visible, exclusive and continuous. But possession is not adverse when both parties claim under the same title, as if a man seized of certain land in fee have issue two sons and die seized, and one of the sons enter by abatement into the land, the statute of limitations will not operate against the other son; for when the abator entered into the land of his father, before entry made by his brother, the law intends that he entered claiming as heir to his father, by which title the other son also claims.

ADVERSITY HUME. See HUME, JOSEPH.

ADVERTISEMENTS OF ELIZABETH, orders issued by Parker, archbishop of Canterbury, in 1566, to enforce dignity and uniformity in the conduct of common prayer and the administration of the sacraments; prescribing the wearing of the surplice and college cap by the clergy, and of the cope in cathedrals and collegiate churches. They were so entirely in accord with Elizabeth's known views that the archbishop had no doubt of her sanction; but after a year's waiting and copious correspondence with her minister Cecil (Burghley), he could not extract an official guaranty and was obliged to assume personal responsibility. Their modern importance springs from the quarrel in the English Church over ritual and their varying interpretation by the High and Low parties. In the Ridsdale case of 1877, the latter, headed by Lord Selborne, held that they prescribed absolutely the vestments to be worn and were infringed by additions; the former, through James Parker, held them merely a minimum for decency.

ADVERTISING (from French *Avertir*, "to notify"). Originally, advertising implied mere publication, a notice for an individual or class, such as legal advertisements. The word, however, is now generally applied to the advertisement of merchandise to the public at large, through periodicals, circulars, posters, painted signs, electrical display, etc. In its present sense advertising is a powerful and legitimate force in the commercial world and in the distribution of commodities, and it has been designated as the literature of persuasion. Its volume in the United States figured in dollars is so great as to place it among the most important of the nation's activities.

History of Advertising.— The rudiments of advertising as it is practised to-day for the promotion of commerce can be traced back as far as commerce itself. With the invention of the rudest forms of writing came advertisements, such as the rewards for runaway slaves. These were written on papyri and well-preserved copies have been exhumed at Thebes. Before writing was developed advertising by means of criers and sign-boards existed. The latter have been used in all ages for the information of the illiterate. Shops in ancient Pompeii had terra-cotta signs, showing a goat to denote a milk-seller's stall, or two men at sword-play to indicate a fencing school. Old tavern signs like the "Star and Garter" are a mediæval form of the same species of advertisement. All shops in London and Paris had such picture-advertisements in the Middle Ages, so that servants unable to read might find them. Until the invention of printing advertising was necessarily of this primitive character. But since the 16th century it has steadily kept pace with the increase in periodicals and books. The oldest newspaper advertisement preserved appears in a German newsbook of 1591, and is a book notice. The first newspaper traceable in France (1612) was partly an advertising medium. The first English newspaper appeared in 1622 and the first advertisement 30 years later. But before that the puffing of books, plays, cure-alls and quacks by posters, processions, etc., was very common. The introduction of tea, coffee and chocolate into England is recorded in old newspaper advertisements (1652–58). Addison's *Tatler* No. 224 (1710) is devoted entirely to descriptions of advertisements of that day in the public press and tells of methods of exploiting pills, plasters, cosmetics, books, houses for rent and advertising for lost animals and runaway wives. Fifty years later (1759) Dr. Johnson thought that "the trade of advertising is now so near to perfection that it is not easy to propose any improvement." The first newspaper advertisement in America appears in the Boston *News-Letter*, of 1704. Notices of shipping and rewards for slaves were numerous in the *New England Weekly Journal* (Boston) of 1728, and shortly after this American newspapers began to carry miscellaneous trade advertisements.

In Great Britain advertisements were heavily taxed until 1833, an impost of 3s. 6d. being levied on each one appearing in a newspaper, though it might be but a laborer's advertisement for work. Upon the abolition of this tax advertising immediately began to grow. To-day Great Britain probably stands next to the United States in the extent of its advertising expenditure. The London and provincial newspapers are heavily patronized, while outdoor advertising is more extensive and less sightly than in this country. English magazines, though numerous, have never been developed as advertising mediums to the extent that the American have. In advertising practice British tradesmen and manufacturers respect and study American advertising methods, adapting many of our devices to their own needs. In Continental Europe advertising finds its chief outlet in the newspapers, which often have tremendous circulations, and by means of outdoor posters and bulletins. The latter forms of advertisement are generally controlled by governments on the Continent, and not only yield a revenue to the state, but are regulated as to size, location and display. While France, Germany, Italy and other countries have numerous weekly and monthly reviews, none of them have ever attained the importance of leading American magazines as advertising mediums. Great Britain and the continental countries have excellent facilities for the transportation of merchandise parcels through the posts, and it might be thought that on this account some system corresponding to our mail order advertising would have been developed. But mail order advertising is limited abroad, probably because most of the population is in close touch with distributing centres, and also because the mass of the people, not so evenly prosperous as American farmers, have a smaller purchasing power.

The real development of advertising as a factor in the distribution of commodities may be said to have begun only with the appearance of the steamboat and railroad, the modern postal system and the telegraph. Its rapid growth since then, especially in the United States, where the great distances between producer and consumer lessen direct dealing, would seem to indicate that it is a legitimate wheel in distributive machinery rather than a form of aggrandized puffery. In this sense, advertising is a modern development. In earlier times it had chiefly a curious interest. A full and entertaining description of early advertising will be found in Sampson's 'History of Advertising from the Earliest Times' (London 1874).

Development of Advertising.—Advertising in the modern sense was first sparingly employed by retail merchants in large cities. About 1840 improved postal facilities in the United States gave opportunity for broadened circulation of periodicals and brought into being the earliest trade, denominational, agricultural and general publications of national circulation. These made it profitable to advertise over wide territory. Soon there were firms, chiefly patent nostrum makers, whose chief expenditure was for advertising, and the value of the new force was appreciated by charlatans, quacks and swindlers to such an extent that the public soon learned to distrust advertising. For more than a generation it was not considered reputable by the great majority of legitimate business houses. The power of advertising as a force in merchandising, however, eventually brought reputable interests into the field. The swindler began to retreat. Among the first classes of manufacturers to advertise widely were makers of commodities, such as sewing machines, typewriters, baking powders, infant foods, etc., then quite new for the most part. In recent years the charlatan has been practically forced out of American advertising mediums as legitimate business increased in them, and during recent years, with public confidence gained, the growth of both advertising and publications in the United States has been so great that publishing and printing now rank seventh in the country's industries, being exceeded only by iron and steel, slaughtering, foundries and machinery, lumbering, milling and clothing. Where formerly the novelties of commerce were advertised, it is now the staples that predominate, such as automobiles and accessories, shoes, flour, cereal foods, clothing, sanitary appliances, etc. The advertising revenue of leading publications is to-day so important that the more progressive publishers censor advertising, and investigate a doubtful advertiser before his announcement is inserted. The practice of the publisher making good to readers any loss they may incur through a swindling advertisement is becoming common in this country, and few losses occur. Moreover, the Government has thrown safeguards around advertising, and through the Federal Post-Office Department effectually prevents swindling operations by denying the use of the mails to an advertiser whose methods will not bear investigation. Advertising has had an immense influence upon the lives of the people, for it not only increases the standard of living and health by introduction of modern conveniences such as baths and sanitary appliances, heating and lighting apparatus, the spread of means of culture, the encouragement of travel, etc., but also tends to improve the quality of commodities without a corresponding increase in cost. Competition in advertising takes the form of price rivalry much more rarely than might be presumed. Advertisers seeking to create national demand for commodities sold under their trade-brands compete rather in offering excellent staples, assuring purity and marketing in sanitary packages. Advertising has resulted in the invention and use of dust, germ and air-proof cartons, boxes and containers. Formerly it was a kind of puffery, but at present the widest advertising is characterized by the completeness with which it presents information and the logical reasoning by which it seeks to persuade readers. One of the most notable phases of modern advertising has been the liberal use of space in newspapers and magazines by large corporations, such as the railroads, manufacturing concerns, political parties and associations, for the purpose of influencing public opinion, it having been proved that this method of reaching and affecting current thought on questions of the day was quick and dependable. In recent years advertising in the United States has outgrown that of every other nation in volume, and has also been conspicuous for its division into special channels, following the lines of the various periodicals and conditions of demand for commodities.

Retail Advertising embraces the announce-

ments of merchants, large and small, in their own communities, from the full page in each day's newspapers employed by great department stores to the small announcements once or twice a week of the minor shopkeeper. This form of advertising is really a species of news, prepared daily, and is of such interest to the public that many readers take newspapers for their store advertisements, and the journals which carry most of these have the largest circulations. Merchants also publish store news by means of circulars through the mails, minor local journals, programs, bulletins, posters, etc.

General Advertising is the general term describing exploitation intended to reach the public nationally or in a group of States. It is found chiefly in magazines and reviews, and in daily newspapers. Street cars, billboards and bulletins are employed as accessories. General advertisers include large manufacturers of food articles, soaps, musical instruments, clothing, beverages, tobacco, household and office supplies, furniture, plate, jewelry, sanitary appliances, etc., as well as the great insurance, steamship and railroad companies, cities and villages seeking population, banks and trust companies and so forth. This is easily the largest branch of advertising, and the one most influential in distribution. It acts as a stimulus to the local merchant's efforts, and is so wide in scope as to touch every class and interest of the nation, however remote.

Mail Order Advertising is the term applied to a form of exploitation peculiarly American. When the newer communities of the West were insufficiently supplied by their local merchants, several intelligent merchants in Chicago, a city advantageously situated for this form of trade, began to advertise commodities to be forwarded direct to consumers by freight and express, receiving orders and remittances through the mails. This was the beginning of "mail order" advertising. Several of these merchants have built up businesses with a gross annual income of $50,000,000 or more, selling practically everything in the way of supplies, machinery, food, clothing, etc., direct to the consumer. Thousands of small advertisers operate with a few commodities through the mails, and many local merchants conduct mail order departments. Mail order advertising is found in the magazines, the farm and religious press, the newspapers and in a class of cheaply printed periodicals known as "mail order journals," having enormous circulations among people on farms and in villages who are not reached by more costly magazines or daily papers. A large volume of mail order advertising is also done through catalogues and printed matter sent through the mails. This branch of trade has had a very large increase in volume since the introduction of the parcels post system.

Agricultural Advertising is a form of publicity similar to mail order advertising, but which appears chiefly in farm periodicals and exploits machinery, fertilizers, farm animals, stock food, building materials and farm supplies.

Trade Journal Advertising appears in the numerous special publications devoted to manufacturing, retail and wholesale, commerce, finance, medicine and the professions, mining, transportation, etc. Its object is to acquaint local merchants with commodities manufacturers wish to distribute, to inform engineers and superintendents of manufacturing plants about new machinery, and, generally, to maintain that great organization which produces and handles commodities up to the point where they pass into the consumer's hands.

Advertising Mediums.— In the United States advertising may be divided roughly into four groups, represented by the mediums used: Periodical advertising, outdoor advertising, street-car advertising and mail order advertising.

Periodical Advertising includes newspapers, magazines, reviews, trade, denominational and farm publications, periodicals printed in foreign languages, theatre and concert programs and other publications, of which there are not less than 23,000 of all kinds. In 1914 the output of printing and publishing in this country was valued at $810,000,000, of which, it is estimated, fully $255,000,000 represented revenue from advertisements in periodicals. Advertising in periodicals exceeds receipts from subscriptions by $90,000,000. The advertising revenue of some of our largest newspapers runs into millions of dollars yearly. Magazines have shown the greatest growth in numbers, circulation and advertising patronage the past 20 years. It is held to be a safe rule to spend 5 per cent of the selling price of a commodity in advertising, so that the advertising for a single month in the 30 leading publications would have to return a gross amount exceeding $25,000,000 to be profitable, or nearly $300,000,000 yearly. While the largest newspaper circulations seldom exceed 300,000 copies, daily, the circulation of several monthly magazines is more than 1,000,000 copies per issue, and of one weekly more than 2,000,000 copies per issue.

Outdoor Advertising includes posters and placards pasted on billboards and barns, painted signs on barns, fences and walls, as well as specially constructed bulletin boards in large cities, many of which are electrically illuminated at night, the erection of advertisements about buildings in process of construction, the use of advertising along railroad lines and at populous seaside resorts, etc. As much as $20 per square foot has been paid for the privilege of advertising on a wall in New York city. Electric signs, with advertisements outlined in incandescent lamps, are an important form of expenditure for outdoor advertising. The largest advertisement of this sort in the world is a single word on a New York building, with letters 60 feet high, visible to 50,000,000 passengers on ferries each year. Advertising of this character adds to the attractiveness of a city by its diffusion of light through the main streets at no cost to the public. Billboards and other outdoor advertising are more often charged with abuses and unsightliness than any other form, and in some cities are prohibited in the vicinity of parks by municipal regulation. They have never come under control to the extent common on the Continent, and in comparison with the outdoor advertisements of London are perhaps pleasing. Outdoor advertising is thought to be effective in reaching persons not habitual readers of newspapers, as well as to lay emphasis upon newspaper and magazine advertising by repeating the names of commodities more fully described in the press. It necessarily affords no opportunities for description of articles, but is confined to repetition of brands and trademarks.

Street Car Advertising is a medium that has become prominent in the United States since the introduction of electric traction and the spread of trolley lines through cities and suburbs. An enormous population is carried in these vehicles — more than 5,000,000,000 cash fares are paid on trolleys yearly, and perhaps two-thirds of these represent an extra ride in the shape of a transfer. It is possible to maintain an advertising card in the 32,000 cars throughout the United States, covering about 400 towns and cities, for $150,000 a year, and in point of the number of persons who can be reached for a given sum the trolley, elevated and subway lines are said to offer the cheapest form of advertising. Car advertising in New York city, it is claimed, has a national circulation owing to the fact that 250,000 persons from all over the country are constantly in the metropolis. More matters may be printed on a car card than on an outdoor poster, and while there are few instances where large advertisers have attained success through the use of billboards alone, quite a number have confined their operations to street cars with profit. As a rule, though, advertising aims toward a balanced effect in magazines, newspapers, cars, billboards and printed matter.

Mail Advertising.— In 1679 a London haberdasher gave to each customer who purchased goods to the value of a guinea a printed list of his stock, and this was regarded as a dangerous innovation because, if followed generally, it would result in the investment of too much tradesmen's capital in printed bills. From this humble beginning the use of circulars and catalogues has grown to a point where, at present, in the United States, every second letter carried through the mails is an advertising letter, and for every periodical posted there is mailed a catalogue or brochure. Postage on advertising matter aggregates between $25,000,000 and $30,000,000 annually and this perhaps represented only one-tenth the cost of compiling and printing such advertising. Mail advertising takes many forms, from the leather-bound catalogue of 500 or more pages to the humble postal card. Every general advertiser has descriptive matter in booklet form which is mailed freely to those who express interest in his magazine or newspaper advertising, and in many instances the periodicals are used only to excite such interest, printed matter being relied upon to tell the whole story of such complicated apparatus as an agricultural implement, heating furnace or piano player. Many advertising letters are sent out to lists of persons who may be interested in certain commodities, either printed in imitation of typewriting or actually written on a typing machine. Mail advertising also embraces the distribution at regular postal rates of small periodicals devoted to the interests of a manufacturing or merchandising house. There are hundreds of these personal business organs, some of which have been of sufficient interest to enlarge into standard magazines. Mail advertising also includes the distribution of what are known as "advertising novelties," ingenious or useful trifles ranging from puzzles to matchboxes, and comic cards to desk calendars, all bearing the name of an advertiser. Blotters, calendars, almanacs, reproductions of paintings and many other forms of printed advertising, upon tin, cardboard, paper, wood, leather, cloth, bark, porcelain, glass and other substances travel through the mails. This is the most costly form of advertising known, in proportion to the number of persons that can be reached for a given expenditure, but as most of this matter is sent to persons thought to be directly interested, it often pays a larger return than advertising distributed promiscuously through periodicals, etc.

Advertising Agencies— Soon after advertising began to be used nationally instead of locally, it was found convenient to put details of correspondence with newspapers, arranging rates, writing the advertisements, seeing that they were properly inserted, etc., into the hands of a new functionary who then sprang up — the Advertising Agent. The first advertising agent to open an office for the reception of advertisements in this country was Volney B. Palmer. He began business in Philadelphia in 1840, and subsequently established offices in Boston and Baltimore as well. Before this, however, the advertising agent was known abroad, for Balzac mentions ('Le Deputé d'Arcis') as among the tenants of a Paris rookery in the thirties, "women of the town, still-born insurance companies, newspapers fated to die young, impossible railway companies, discount brokers and advertisement agents who lack the publicity they profess to sell — in short, all description of shy or doubtful enterprise." When national advertising was new there existed no newspaper directories. To advertise in a given territory it was necessary to go to an advertising agent who had lists of the newspapers and knew their rates. Agents often purchased several columns of space in a number of newspapers by the year, reselling allotments to advertisers for a price less than the newspaper would charge direct. The advertising agent was thus a broker, and to encourage him in developing advertising the newspapers paid him a commission on what he sent in. Then, as demand grew, he became also an adviser to new advertisers, giving counsel as to the ways in which a given appropriation should be spent, preparing the text and illustrations and supplementary matter to be used, checking insertions in papers and bills, etc. This detail work is complex, and the advertising agent usually performs it more reasonably than an advertiser could do himself. From a broker in space, the advertising agent of the present day has become a specialist whose services are valued because he has a wide experience in directing the operations of many advertisers, as well as an equipment for writing and illustrating advertising matter. While the advertising agent is still paid by commissions of 10 to 15 per cent allowed him by publishers of newspapers and magazines, he is in no sense the agent of the publishers, but receives rather a wholesale rate upon advertising space, which he sells to the advertiser at a retail or gross price. An advertising agent's interests are so wholly bound up with his advertising client's that in some instances he receives for his services a salary besides. Advertising agents have been of the utmost importance in the development of advertising, for by active work in leading conservative business houses to utilize this modern distributive force, they have built up the revenues of publishers, improved publications and driven advertising charlatans from

the field. A few of the largest advertisers maintain departments in their business to prepare and supervise their own advertising, while publishers of magazines and newspapers also carry on independently the work of converting business houses to advertising. Despite this, the agent's function has remained an indispensable one, and with the development of advertising he has entrenched it by specializing. One of the leading New York advertising agencies, for example, has been instrumental in building up the large showing of steamship, railroad and travel advertising now carried in leading magazines, with supplementary advertising of hotels and resorts. Two other agencies are known for their work among advertisers of agricultural implements, another has found its field in the development of textile advertising through magazine and trade journal advertising, etc.

With the past decade the advertising agent has ceased to be what the name would imply and has really become a professional man whose advice is sought as such by the largest commercial and financial concerns. The leaders in this new profession have become experts on trade conditions and in the introduction of new goods or the development of trade in well-established lines. The modern well-equipped advertising agency has attached to it not only competent writers of advertisements, artists and photographers, but experts in salesmanship who study economic questions and conditions with the greatest thoroughness. This branch of the work has been carried by some of the leading agencies to the point of becoming advisers and lecturers to the regularly employed traveling men of the concerns represented.

Special Advertising Agencies differ from the foregoing *general* advertising agencies in that they actually represent the publishers of certain newspapers or miscellaneous journals in a given territory, promoting advertising only for those journals and receiving commissions on all business that comes from such territory. These special agents are found chiefly in New York and Chicago, where a large percentage of advertising originates, and are simply branch offices of publishers outside such cities, who take such means for being represented. In several States associations have been formed among the smaller daily papers who unite in employing a representative who acts as their agent in procuring business.

As advertising has developed in this country it seeks ever new, varied channels, so that while it is possible by a proper selection of mediums to reach practically the whole public, it is also possible, on the other hand, to appeal to a small group of persons interested in some special commodity. No adequate outline of the many forms of advertising could be given in an article of this scope, and readers interested in a fuller presentation of methods, cost, the stories of famous advertisers, etc., are referred to 'History of Advertising' (London 1874); 'Modern Advertising' (New York 1905); 'The Theory of Advertising' (Boston 1904); 'Forty Years an Advertising Agent' (New York 1906); 'Principles of the Mail Order Business' (Chicago 1903); 'The Business of Advertising' (London 1905); Balmer, 'The Science of Advertising' (1909); Spies, 'The Art of Publicity' (1910); 'Advertising and Progress' (London 1914); 'Advertising: Its Principles and Practice' (New York 1915); 'Analytical Advertising' (Detroit 1912).

American advertising has a large periodical literature of its own, comprising fully 25 weekly and monthly journals. Many of these are illustrated and assume the dignity in matter and typography of the standard magazine. Among the most notable of these publications are *Printers' Ink* (weekly, New York); *Advertising and Selling* (monthly, New York); *Mail Order Journal* (monthly, Chicago).

FRANK PRESBREY,
The Frank Presbrey Co., New York.

ADVERTISING, The Psychology of. It seems quite natural that the first notably successful attempts to apply psychology to the needs of the commercial world should have been made in the field of advertising. The fundamental purpose of the advertiser is to influence human minds. Inasmuch as psychology is simply a systematic study of those same minds, the advertiser, seeking a scientific basis for his work, must find that basis in the science of psychology. But for other reasons than those pertaining to subject matter problems of advertising are peculiarly open to psychological treatment. The executive, the salesman, the labor leader and many others are primarily concerned with influencing human minds, but the conditions of mind with which these men have to deal are all remarkably complex and, in the present stage of science, it is extremely difficult to isolate them for purposes of exact observation. The problems of advertising, on the other hand, are more simple and consequently more open to exact observation.

Perhaps we can gain an idea of what applied psychology really is in no better way than by surveying a few of the psychological principles to which the successful advertiser pays heed. It stands without saying that an advertisement, in order to be effective, must gain the attention of those who may purchase a product the merits of which that advertisement sets forth. So the question becomes: "To what kinds of things are people most apt to give attention?" The psychologist says that on the whole people are most apt to pay attention to those things which are novel, either in themselves or because of their unusual setting or presentation. And the phychologist adds further that the comparatively prolonged attention which people give to the best examples of advertising would not be thus prolonged were it not for the fact that those advertisements are interesting and easily comprehended. These few underlying principles of securing and holding the attention of possible customers are much easier to cite than to put into practice. As a result a distinct profession of advertising artists and copy-men is growing up in this country. In experimental psychology these men can find many facts to guide them in making the most of the space at their disposal. The laws of color contrast, the pleasingness and displeasingness of certain color combinations and of figures of certain proportions; all these had been worked out and more or less organized in the psychological laboratories while advertising was still appearing in its earlier crude forms.

To gain and hold the attention of the pub-

lic is not, however, the final purpose of an advertisement. The advertiser aims so to influence the minds of purchasers that when they are in the market for a cake of soap or an automobile they immediately think of his particular brand of soap or his particular make of automobile. In other words, he must get the idea of the article which he is offering associated with the idea of the class of articles to which it belongs. Here again in this need he can find psychological fact to guide him in conducting his campaign. For example, the psychologist has established that the strength of the association between two ideas depends among other things upon the frequency, vividness and recency of the past association of those same ideas. If, upon thinking of automobiles in general, that idea is followed by the idea of some particular make of automobile, that sequence of ideas may be due to the fact that of all automobiles this one has been brought to my attention most often by advertisements, by the talk of my friends or by seeing the actual article. The sequence may be due equally well to the vividness of a particular experience with this machine or to the recency of such an experience. These few principles of association readily explain why experienced advertising men assent to the superiority of the long, persistent campaign. When the advertising man conducts a continuous campaign he is paying heed to the two laws of frequency and recency. When he enrolls the services of a convincing and clever writer or artist he is paying heed to the law of vividness.

Still it is one thing to get the public to think of a particular brand of goods and quite another to get that public to complete the act of buying. Having done his best to influence men's thoughts, the advertiser must know how to turn those thoughts into action. Now, according to one of the most fundamental laws of psychology, any thought of an act tends to result in that act unless it be interfered with by a stronger or a contrary idea. Few laws are more important for the advertiser to keep in mind than this one. Unless he has salesmen to follow up mere educational advertising he must put into the public mind not only an idea of his goods but also the idea of purchasing those goods. If his advertisement is to do his selling it must give the public a specific idea of just how and where the purchase can be made. Moreover, if the goods which the advertiser is offering are expensive or in a line where the public still feels no need, then there are contrary ideas already in the public mind which the advertiser must overcome. Often he will have to make use of argument. To do so effectively he must be familiar with the motives which make one course of action seem more favorable than others. He must take into account the instincts and emotions of men and the customs, prejudices and sentiments of particular groups. And again he will find the scientific basis for his procedure in psychology.

It should be kept in mind that the above account is but a sketch of some of the outstanding applications of psychology to advertising. Many of the scientific principles outlined were recognized by the advertiser before any serious attempts were made to apply psychology to his work. But the later knowledge of psychological methods has systematized what in most cases was formerly unorganized tradition. And there is still much to be done. The relative merits of the daily press, the weekly journal, the fiction magazine, the billboard, the street-car display, for particular kinds of advertising; the various motives to which the advertiser of this or that product can appeal with the greatest success; these and many other problems can and will be solved by this youth among the applied sciences — the psychology of advertising.

WALTER DILL SCOTT,
Director Bureau of Salesmanship Research, Carnegie Institute of Technology, Pittsburgh.

ADVOCATE, (1) Originally one whose aid was called in or invoked; one who helped in any business matter; (2) in law, at first, one who gave his legal aid in a case, without, however, pleading, this being the function of the *patronus;* (3) the *advocatus fisci,* who attended to the interests of the *fiscus,* or the emperor's privy purse.

In the old German empire, a person appointed by the emperor to do justice. In Germany and elsewhere juridical advocates were made judges in consequence of their attending when causes were pleaded in the count's court.

In the mediæval church, one appointed to defend the rights and revenues of a church or monastery. The word advocate, in the sense of a defender of the Church, was ultimately superseded by that of patron but it still lingers in the term advowson (q.v.).

Constitutional advocates, in Rome, pleaded before the consistory in cases relating to the disposal of benefices which they opposed. Elective advocates were chosen by a bishop, an abbot or a chapter. Feudal advocates were persons assigned lands on condition of their fighting for the Church, leading out their vassals for the purpose. Matricular advocates defended the cathedral churches. Military advocates were appointed to fight for the Church. The Devil's advocate is a Roman ecclesiastic whose office it is to urge whatever objections may exist to the canonization of any proposed saint.

In English law, originally one who pleaded a cause in a civil, but not in a criminal, court; alone entitled to plead as counsel in ecclesiastical and admiralty courts which are now thrown open to the ordinary bar. Now, in English and American law, one who pleads a cause in any court. It is not, properly speaking, a technical word but is used only in a popular sense, while the attorney and barrister (q.v.) have defined special attributes.

ADVOCATUS DIABOLI, dĭ-ab'ō-lī, or "devil's advocate," popularly applied to persons who accuse maliciously or slander. The term and its significance is derived from the procedure in the Roman Catholic Church, in which, when a sanctified person is to be canonized, someone is appointed to scrutinize his past life and bring forth all facts mitigating against the proposed honors. This official is termed the "advocatus diaboli," while the official appointed to defend the candidate for honors is termed "advocatus Dei," God's advocate.

ADVOWSON, signifying in England the right of presentation to a church or ecclesiastical benefice. Advowsons are either "appendant" or "in gross." Lords of manors were originally the only founders, consequently the only patrons of churches, and so long as a right of patronage exists annexed or appended to the manor it is called an advowson appendant. Such rights are conveyed with the manor. But where the property of the advowson has once been separated from the property of the manor by legal conveyance it is called an advowson in gross, or at large, and is annexed to the person of its owner and not to his estate. Advowsons are further divided into "presentative," "collative" and "donative." The first is where the patron has the right of presentation to the bishop and may demand of him to institute his clerk if he find him qualified. The second is where the patron and the bishop are identical persons. The third is when the sovereign, or a subject by his license, founds a church and ordains that it shall be at the sole disposal of the patron, subject to his visitation only. Blackstone classed advowsons as the first of the incorporeal hereditaments and they still constitute in England an important class of property interests.

ADYE, ā'dĭ, Sir **John Miller,** British soldier, administrator and author: b. 1 Nov. 1819; d. 26 Aug. 1900. He served in India and in Egypt, rising to be general and colonel commandant of the Royal Artillery, and was governor of Gibraltar from 1883 to 1886. He wrote 'The Defense of Cawnpore' (1858); 'A Review of the Crimean War' (1860); 'Sitana: A Mountain Campaign on the Borders of Afghanistan in 1863' (1867); 'Recollections of a Military Life' (1895); and 'Indian Frontier Policy' (1897).

"A. E." See Russell, George W.

ÆDILES, ē'dīlz, public functionaries or commissioners of ancient Rome, who, according to Cicero, undertook the care of the city, the repair and preservation of temples, aqueducts and sewers, street-cleaning, paving and traffic regulations, precautions against fire, dilapidated buildings and dangerous animals, superintendence of baths and taverns, punishment of gamblers and usurers, inspection of weights and measures and the care of public morals generally. From 494 B.C. there were two "plebeian ædiles" until 471 B.C., when two "*Ædiles curules*" were added from the patricians, chiefly to manage the Roman games. In 44 A.D. Cæsar added the two "*Ædiles Cereales*" to have charge of the public granaries. Consult Abbott, F. F., 'Roman Political Institutions' (New York 1901).

ÆE'TES. See Argonauts.

ÆGA'DIAN ISLANDS, a group lying off the western extremity of Sicily and consisting of Maritimo, Favignana, Levanso and Le Formiche. Favignana, the largest, is about 14 miles in circuit and has productive tunny and anchovy fisheries. The group has a population of 6,300. Near these islands the Romans won the naval battle with the Carthaginians, 741 B.C., which ended the first Punic war.

ÆGEAN SEA, ē-jē'an or ĭ'gā-an, the old name of the gulf between Asia Minor and Greece, now usually called the Grecian Archipelago (q.v.). During the European War from 1914 it was the scene of much naval activity. See War, European.

ÆGEUS, ē'jūs. See Theseus.

ÆGINA, a Greek island about 15 miles southwest of Athens, in the Gulf of Ægina (old Sinus Saronicus); area, 32 square miles; pop. about 7,000. It is the triangular top of a partly submerged rocky hill, with deep gorges and ravines, and the eastern half rocky and unproductive; but the western is a well-cultivated plain which, under the warm air and sea, produce the best Greek almonds, with olives and other fruits, wine and some grain. The non-agricultural inhabitants do a considerable commerce and navigation from the one port, the capital, Ægina (pop. about 5,000), at the northwest, on the site of the old Greek town, of which considerable remains are left, the ruins of solidly-built walls and harbor moles still attesting its ancient size and importance. According to the legend, the island was named after the nymph Ægina, brought thither by Zeus. Historically, its first inhabitants were Achæans and were expelled by a Dorian colony from Epidaurus, under whom it was one of the foremost commercial cities of Greece, full of hardy, energetic people, born seamen, who covered themselves with glory at Salamis. They were later forced to become a tributary part of the Athenian empire, and in 431 B.C. were expelled altogether. Lysander afterward restored them, but the city's old importance was gone. On a hill in the northeast are the remains of a splendid temple of Zeus Panhellenius (or, as others maintain, of Athena), many of the columns of which are still standing. Here are found early in the 19th century a number of marble statues which once adorned the east and west fronts of the temple; they were purchased by the King of Bavaria in 1812, the deficient parts restored by Thorwaldsen, and are now among the chief ornaments of the Glyptothek at Munich.

ÆGINETA, ĕj'ĭnē'tą, **Paulus,** a Greek physician of the 7th century: b. in the island of Ægina. He wrote 'De Re Medica Libri Septem,' a synopsis of medicine in seven books, the sixth of which, dealing with operative surgery, is of special historical value. An English translation by Adams was published in London (1834) and a French edition by Brian in Paris (1855).

ÆGINHARD. See Eginhard.

ÆGIR, ā'jir, a Norse god of the sea-storms, who treats the other gods to foaming beer and has a wife Ran caring for those lost at sea. Their nine daughters are sea-waves, with names representing the aspects of the ocean.

ÆGIRITE, a mineral essentially identical with acmite (q.v.). Like it, ægirite is monoclinic and is a silicate of sodium and both ferric and ferrous iron, the former largely predominating. It is a member of the pyroxene group and is regarded by Miers as an alkali diopside. It is distinguished from acmite by its simple, prismatic crystals, usually bluntly terminated, its dark green color and its characteristic grass green, pale green and brown pleochroism. Its hardness is 6 to 6.5 and specific gravity about 3.53. It occurs in long prismatic crystals chiefly in the elæolite-syenites of Norway and Arkansas.

ÆGIS, e'jis ("storm"), the shield of Zeus, fashioned by Hephæstus (Vulcan). From a probably mistaken etymology it was often said to have been the skin of the goat Amalthea, who suckled Zeus and to have had the Gorgon's head in the centre. When Zeus was angry he waved and shook the ægis, making a sound like a tempest, by which the nations were overawed. It was the symbol of divine protection and became in course of time the exclusive attribute of Zeus and Athene.

ÆGISTHUS, ē-jis'thŭs, son of Thyestes and cousin of Agamemnon; adopted son of Atreus. He did not accompany the Greeks to Troy, and during Agamemnon's absence lived in adultery with his wife Clytemnestra. He assisted her in murdering her husband on his return, but was himself put to death seven years later by Orestes, son of Agamemnon. This is the account given by Homer; the tragic poets make Clytemnestra alone murder Agamemnon, her motive in Æschylus being her jealousy and wrath at the death of Iphigenia of Cassandra; in Sophocles and Euripides, the latter alone. Later writers also describe Ægisthus as the son of Thyestes by unwitting incest with his daughter Pelopia. See AGAMEMNON; ATREUS.

ÆGIUM, ē'jĭum, Greece, modern VASTITZA, though officially restored to its ancient name. See ACHAIA.

ÆGLE, ē'gl', a genus of plants of the natural order *Aurantiaceæ*. The *Ægle marmelos* is the tree which produces the bhel fruit. This fruit is most delicious to the taste, being exquisitely fragrant and nutritious, but laxative. It has been long used in India with great effect as an astringent in cases of diarrhœa and dysentery, when a little unripe.

ÆGOSPOT'AMOS, or ÆGOSPOT'AMOI ("goat-river"), the Thracian Chersonesus (now peninsula of Gallipoli): a river and town memorable for the battle, or rather surprise, in which the Spartan general Lysander annihilated the Athenian fleet, 13 Dec. B.C. 405, and ended the Peloponnesian war by the temporary ruin of Athens. The latter had 180 vessels, with a number of coequal commanders, only one of whom (Conon) had common military sense, and perhaps treachery was at work; while Lysander was an eminent military genius had no one to consult but himself. Having put them off their guard by ostentatious carelessness and absence for several days, he swooped down upon them one day at dinner-time while their ships were totally unprepared (despite the warnings of Alcibiades, whose castle was close by and who was fully a match for Lysander and destroyed or captured the entire fleet except Conon's small squadron. Athens fell under the rule of Sparta, which set up an aristocratic government, the outcome of which is infamous in history as the Thirty Tyrants.

ÆGYPTUS, in Greek legend, son of Belus, King of Arabia; conquered the land called Egypt from him. He gave his 50 sons in marriage to the 50 daughters of his brother Danaus, who had established himself in Argos and was jealous of his brother, and who obliged all his daughters to murder their husbands on the night of their nuptials; Hypermnestra alone spared her husband, Lynceus. Even Ægyptus was killed by his niece Polyxena. See DANAUS; EGYPT.

AEHRENTHAL, ā'rĕn-tāl, BARON (afterward COUNT), **Alois Lexa von**, Austrian statesman: b. Grosskal, Bohemia, 27 Nov. 1854; d. Vienna, 18 Feb. 1912. Studied law at Prague and Bonn; entered diplomatic service 1877; attaché, Saint Petersburg 1878; chief of cabinet under Count Kalnoky (foreign minister) 1883–88; councillor of embassy, Saint Petersburg, till 1894; minister to Rumania 1895–99; ambassador to Russia 1899–1906. In October 1906 he succeeded Count Goluchowsky as foreign minister, the latter being forced to retire on account of Hungarian hostility. Aehrenthal was believed to be a strong Russophil with Conservative leanings and to have worked for the restoration of the Drei Kaiserbund, or League of Three Emperors, which had dominated Europe between 1870 and 1878. He soon made a new departure in the foreign policy of his country. Whereas Goluchowsky had earned the title of a "brilliant second" to Germany, the new minister maintained the perfect equality of Austria-Hungary and her independent right to carry on her foreign relations without previous consultation and approval by Berlin. In regard to Hungary the dual minister has always a difficult rôle to play, and Aehrenthal wisely profited from the failure of his predecessor. His first coup was played within a month of taking office, when he granted Bulgaria relief from the burden of the "capitulations," a relic of the old times of Turkish misrule, under which no foreign subject could be arrested or tried without the presence of a consular officer of his own nationality. Nearly all the powers interested had signified their readiness to abolish the capitulations if every other one would consent. Austria, however, had always opposed the change, and it was left for Aehrenthal to render Bulgaria this graceful service, which cost his country nothing and laid the principality under a great obligation. He reversed the 10 years' old policy of playing off the Slav against the non-Slav Balkan states and settled an old quarrel with Serbia by resuming negotiations with that country. In January 1908 he sprang a surprise upon Europe by his plans for a Novi-Bazar railway, which he said would lay the foundation for further developments of Austria in the Balkans. This proposal was regarded as peculiarly unfortunate in view of the changes taking place in Turkey, which, it was hoped, gave promise of true progress in the Ottoman Empire. Aehrenthal had exerted himself to prevent the Anglo-Russian rapprochement of 1907, and the railway project was his answer to it, as a blow aimed at Russian predominance in the Balkans. The meeting of King Edward and the Tsar of Revel (July 1908), and the Turkish revolution, gave him his opportunity. A meeting between him and the Russian foreign minister (M. Izvolsky) in September relieved the strain between the two powers for a time, but events followed one another with startling rapidity. Eight days later Prince Ferdinand proclaimed himself Tsar of independent Bulgaria, and in another two days the Emperor Francis Joseph issued a proclamation that Austro-Hungarian sovereignty was extended to Bosnia and Herzegovina, in other words, the two provinces were annexed. This was a step undoubtedly premeditated ever

since the Berlin Treaty of 1878, by which these provinces were handed over to Austria to administer until such time as the Turks should be more competent to govern them. The move was a flagrant violation of that treaty, and Aehrenthal refused to entertain the idea of a conference on the ground that it would seem like "a tribunal in which Austria-Hungary would be the defendant." Serbia and Montenegro threatened war, and the situation at last became so dangerous that the acquiescence of Turkey had to be bought by concessions and a sum of $11,000,000. Early in 1909 everything was ready for war on the southeastern frontier, but Serbia was forced to yield when it became evident that Germany had compelled Russia to withdraw all hope of practical support. Aehrenthal had won a victory; but he had planted the seeds of the European war and placed his country more firmly than ever under German tutelage.

ÆLFRIC, the Grammarian, Anglo-Saxon author and translator; fl. 1006. In his youth he was taught by a secular priest who could scarcely understand Latin. "There was no one," he says, "who could write or understand Latin letters until Dunstan and Æthelwold revived learning." This may account for his warm interest in education and his industry in translation and compilation. 'A Treatise on the Old and New Testaments' (printed 1623); the 'Heptateuchus,' an abridgment and translation of the first seven books of the Old Testament, with the Book of Job (printed 1699); a 'Pastoral Letter,' written for Wulfstan, archbishop of York (1003–23), in which he makes the archbishop declare that he will not forcibly compel his clergy to chastity, but admonishes them to observe it; a 'Latin Grammar and Glossary' (printed by Somner 1659).

ÆLIA, a Roman *gens,* whose members included Sejanus, Hadrian and the Antonines, as also the families of Pætus (q.v.), Gallus, etc.

ÆLIA CAPITOLINA, the new name given to Jerusalem by Hadrian when he colonized it with Romans after the insurrection of 132–35 A.D.; he built a temple to Jupiter Capitolinus and prefixed the name of his own *gens,* the Ælian. The Christian emperors after Constantine restored the old name.

ÆLIANUS, Claudius, ē-li-ā'nus, a noted Roman sophist who flourished in the first half of the 2d century: b. Præneste, Italy. Of his many works, written in Greek, two are extant: 'Various Histories,' or narratives, in 14 books, and 'Of the Nature of Animals,' anecdotes of animals,—most entertaining and uncritical compilations. The 'Peasants' Letters' accredited to him are spurious. Best ed., Hercher, 1858 and 1864.

ÆLIANUS TACTICUS, a Greek tactician and author of the 2d century. His 'Tactikē Theōria' (written about 106 A.D.) is a valuable historical and bibliographical treatise on Græco-Macedonian military tactics, based on the best authorities, the chief of which is the lost work of Polybius. The treatise exerted great influence on the Byzantines and Arabs, and was the groundwork of the Spanish, Dutch and other European army organizations of the 16th and 17th centuries. Theodore Gaza translated it into Latin, and from this a German translation appeared (Cologne 1524); it was translated into French by Machault in 'Milices des Grecs et Romains' (Paris 1615); into English by Bingham (London 1616), and by Viscount Dillon (London 1814); it reappeared in German with translation, notes and reproductions of the original illustrations, edited by Rüstow and Koehly in 'Griechische Kriegsschriftsteller' (Leipzig 1855).

ÆLURODON, ēl-ur-o'-don, a primitive carnivore fossil in the rocks of the Wahsatch and Unita (American) stages of the Pliocene Age; a hyena-dog. It "was as large as the modern wolf, but had a short, heavy, mastiff-like head, and was distinguished from any living canids by the cat-like construction of the carnassial teeth." (Osborne, 'Age of Mammals,' 1910).

ÆMILIANUS, C. Julius, Emperor of Rome: a Moor who rose from the lowest stations; governor of Pannonia and Mœsia, whose troops killed the Emperor Gallus and gave him the crown. He reigned only four months, when he was killed in his 46th year by his own soldiers, who then offered the crown to Valerian, August 253 A.D.

ÆMILIAN WAY, a Roman state road about 185 miles long, built by the consul Marcus Æmilius Lepidus, 187 B.C., primarily as a military road to make easy communication between Rome and her new possessions in Cisalpine Gaul (Lombardy). Beginning at Ariminum (Rimini) on the Adriatic, where the Flaminian way from Rome ended, it traversed Bononia (Bologna), Mutina (Modena) and Parma, crossed the Padus (Po) at Placentia (Piacenza) and ended at Mediolanum (Milan).

ÆMILIUS PAULUS, surnamed MACEDONICUS, a noble Roman of the ancient family of Æmilii: b. 230 B.C.; d. 160. He conquered Perseus, King of Macedon, and on this occasion obtained a triumph, 168 B.C. During the triumph two of his sons died. He bore the loss like a hero and thanked the gods that they had chosen them for victims to avert bad fortune from the Roman people. He was father of the renowned Scipio Africanus the Younger.

ÆNEAS, in the Iliad, a Trojan prince, son of Anchises and the goddess Venus; second only to his kinsman Hector among the Trojan chiefs. Other stories tell that the care of his infancy was entrusted to a nymph; but at the age of five he was recalled to Troy and placed under the inspection of Alcathoüs, his father's friend and companion. He afterward improved himself in Thessaly under Chiron the Centaur, whose house was frequented by all the young princes and heroes of the age. Soon after his return home he married Creusa, Priam's daughter, by whom he had a son called Ascanius. Virgil, whose object is to connect him (according to Latin tradition of untraceable source) with the origin of Rome, tells his further story as follows in the Æneid: In the night of the capture of Troy by the Greeks, Hector warned him in a dream to fly. Æneas notwithstanding rushed to the fight; but after Priam was slain returned to his home and carried off his father, his child and his household gods, losing, however, his wife, Creusa, in the confusion. With 20 vessels he sailed for Thrace, where he began to build Ænos, but terrified by a miracle, abandoned the attempt. Thence he went to Delos to consult the oracle.

Misunderstanding its reply he went to Crete, from which he was driven by a pestilence; thence to the promontory of Actium, and in Epirus found Helenus and Andromache; thence past Italy and through the Straits of Messina, and circumnavigated Sicily to Cape Drepanum on the western coast, where Anchises died. A tempest drove him on the shore of Africa, where Dido received him kindly in Carthage and wished to detain and marry him. Jupiter, however, mindful of the Fates, sent Mercury to Æneas and commanded him to sail for Italy. While the deserted Dido ended her life on the funeral pile, Æneas set sail with his companions and was cast by a storm on the shores of Sicily, in the dominions of his Trojan friend Acestes, where the wives of his companions, wearied of a seafaring and homeless life, set fire to the ships. Nevertheless, after building the city Acesta, he sailed for Italy, leaving the women and the sick behind. He found near Cumæ a sibyl his father's ghost had ordered him to seek, who foretold his destiny and aided his descent into the lower world; here he saw his father and had a prophetic vision of the glorious destinies of his race. On his return he embarked again and reached the eastern shore of the river Tiber, in the country of Latinus, King of the Aborigines (q.v.). His daughter Lavinia was destined by an oracle to a stranger, but promised by her mother Amata to Turnus, King of the Rutuli. This occasioned a war, after the termination of which, Turnus having fallen by his hand, Æneas married Lavinia. His son by Lavinia, Æneas Sylvius, was the ancestor of the kings of Alba Longa, and of Romulus and Remus, the founders of the city of Rome. From Ascanius' son Iulus the Romans derive the Julian family. For the real origin of Rome, see that title.

ÆNEAS SILVIUS. See PIUS II.

ÆNE'AS TAC'TICUS, a Greek writer on war tactics of the 4th century B.C., by some authorities identified with Æneas of Stymphalus, Arcadia, a general who fought at Mantinea 362 B.C., as recorded by Xenophon. His several treatises on the art of war, of which the only one in existence deals with the best methods of defense for a fortified city, were epitomized by Cineas, minister of Pyrrhus, King of Epirus, and are mentioned by Polybius and Ælianus. Containing anecdotes and illustrations from Thucydides and Xenophon the work, as edited and published by Hercher (Berlin 1870), and with introduction and notes by Hug (Leipzig 1874), has much value and interest. For a challenge as to the identification with the Stymphalian general and for a bibliography consult Williams, T. H., *American Journal of Philology* (Vol. XXV, 1904).

ÆNEID, The. The 'Æneid' of Vergil is the epic of imperial Rome, as the Homeric poems are the epic of early Greece, the 'Divine Comedy' of mediæval Italy, and 'Paradise Lost' of Puritan England. For two hundred years before Vergil (70–19 B.C.) there had been current the legend of the founding of Rome by Æneas, a minor Trojan hero of the Iliad, son of Venus and Anchises and father of Ascanius or Iulus, ancestor of Julius Cæsar and Augustus. The 'Æneid' gave it final form and sanction, and made it canonical. The first six books of the poem, after introducing Æneas and his companions shipwrecked near Sicily and driven to the Carthaginian coast, where they are received at the court of Queen Dido, narrate the hero's escape from burning Troy, his wanderings on sea and shore in search of the divinely appointed but unknown goal, his tarrying at Carthage, the passion of the Queen and her fatal despair when divine intervention forces him on, the funeral games in Sicily in honor of Anchises, the visit to the underworld, where the destiny of Rome and the Julian family is made known to him, and his departure from sacred Cumæ, near Naples, for the Tiber's mouth, where his landing takes place at the opening of the seventh book. The last six books, the narrative of his troubled alliance with King Latinus of Latium, and of his wars, assisted by the Arcadian King Evander of primitive Rome, with Latian and Etruscan enemies under Turnus and Mezentius, close with the slaying in single combat by Æneas of Turnus, his most persistent and spirited foe, and the clearing of the stage for the beginnings of Roman greatness.

It is immediately apparent — to the shallow reader offensively so — that the 'Æneid' is an imitation or adaptation of the Homeric poems; the first six books an Odyssey, with the divinely guided and divinely hindered hero Æneas reaching Italy after seven years of blind wanderings, as Odysseus reached his Ithacan home in similar wise 10 years after the fall of Troy, and the last six an Iliad of battling, with the Trojan cause victorious in Latium as the Greek cause had been at Troy. This manner of blending, or rather building, a unit out of two Greek originals was so well known in Roman literature that as early as Terence (195?–169), who practiced it in the field of the drama, continuing a tradition at least as old as Nævius (*circa* 270–199), it had received the technical designation of "contaminatio." To deny the 'Æneid' originality, however, or even genius, argues in the critic only a superficial acquaintance with it. It was immediately received with enthusiasm by the cultivated in a generation which was well acquainted with good literature and highly critical, it enjoyed no less favor with the multitude, was used in the Roman schools, made deep impressions on the hearts, and often on the style and content, of such men as Horace, Propertius, Seneca, Lucan, Statius and Juvenal, captivated Augustine, took possession of the Christian imagination, cast over its author in the Dark Age the glamor of prophetic and magical power, inspired in Dante *lo bello stile* and gave him the *maestro* who directed his feet in the other world, was made Christian in Tasso's 'Jerusalem Delivered,' entered into the ideals and execution of Spenser, Milton and many others of the long line of modern poets in all European languages, was to Tennyson "Light among the vanished ages; star that gildest yet this phantom shore," and has held its place through the centuries as a necessary part in the culture of the Caucasian peoples. Admiration so widely spread and so long continued, and influence bearing such abundant fruit, are possible only with works of power. With its faults freely conceded, the 'Æneid' remains one of the world's three or four epic masterpieces.

For reasons both of content and form, comparison of the 'Æneid' with the 'Iliad' and

the 'Odyssey' is inevitable; but it is also not quite just. There are two kinds of epic. There is the natural or folk epic, a more or less spontaneous and naïve growth by oral and popular tradition, such as the 'Nibelungenlied,' 'Beowulf,' the 'Song of Roland' or the 'Cid'; and there is the artificial or literary epic, the deliberate, though also inspired, creation of a single mind in an age of cultivation and reflection, such as the 'Divine Comedy,' 'Jerusalem Delivered,' 'Orlando Furioso,' 'The Lusiad' or 'Paradise Lost.' To the former belong the Homeric poems, though their art is by no means as "unconscious" as is sometimes supposed; to the latter class belongs the 'Æneid.' Vergil's poem is not merely a more or less dull reflection of the 'Iliad' and the 'Odyssey.'

In the first place, the 'Æneid' is a poem with a purpose. It is not the spontaneous "singing" of primitive inspiration; it is not, and was not intended to be, the mere telling of an entertaining tale. The literary epic has usually a conscious purpose — "to justify the ways of God to men" ('Paradise Lost'), to fashion "XII Moral Virtues" ('The Færie Queene') — as well as the less artificial purpose of artistic self-expression. The 'Æneid' is a poem with a national, patriotic purpose. The writer of the 'Eclogues' and the 'Georgics,' who had helped to reawaken the love for field and orchard in a time when the Roman world was fatigued with the disorders and violences of a century and longing for peace and quietude, was prompted by the court, as well as by his own inspiration, to celebrate the greatness, under divine warrant, of Roman achievement and Roman purpose. The great figure in the 'Æneid' is not Æneas, or Dido, or the Julian ruler, but Rome. Throughout the 12 books — in the councils of the gods, in the Carthage episode, in the hero's converse with the underworld, in the endless conflicts and cruelties on the plains of Latium — there is ever felt in the background the idea of the oncoming, divinely ordered, irresistible greatness of Rome. It was the century in which the phrase *urbs æterna* was coming into use and the faith in Roman destiny was ripening.

In the second place, the sources of the Æneid's inspiration and matter include not only the 'Iliad' and the 'Odyssey,' but the Cyclic poems and the Homeric Hymns, Apollonius Rhodius' 'Tale of the Argonauts,' and the whole range of Roman historical and poetic literature — Ennius, Nævius, Cato, Varro, Lucretius. In other words, Vergil was a widely and deeply cultured student and lover of poetry and history, and the 'Æneid' is the product of poetic inspiration working upon an exceedingly rich intellectual and spiritual equipment in an age of culminating greatness. In the respect of intellectual preparation Vergil is to be compared with poets like Dante, Tasso, Milton and Spenser, whose works are so permeated by the classical spirit and so filled with classical material as to remind the reader of a rich mosaic. He is no more the plagiarist that Macrobius, three centuries later, charged him with being, than Milton, using from the full store of the classics and Hebrew literature, was a plagiarist.

In the third place, the 'Æneid' is a poem of many and varied interests. The reader must not look to it for the simplicity and spontaneity and speed of primitive story-telling genius, the qualities that make the natural epic great. As compared with the Homeric poems, it is not easy and fluent reading. It is a complex of the primitive and the sophisticated, of the heroic and the actual, of the legendary and the real, of the historic and the prophetic, of the Hellenic and the Roman, of age-old religion and the new philosophy, of the archæological and the modern, of the political and the poetic, of the classic and the romantic. It is filled with the humility of faith, and with gentle personal emotion, but also with national pride, and with the dignified and austere feeling of might consciously engaged in working the will of heaven. "To write an enduring epic," says Cruttwell ('History of Roman Literature,' p. 266), "a poet must not merely recount heroic deeds, but must weave into the recital all the tangled threads which bind together the grave and varied interests of civilized man." It is not to be wondered at that criticism has found in the 'Æneid' some lack of the evenness, simple directness and bright rapidity of narrative and language, the heroic fire, the bigness of stage, the variety and richness of character, and the dramatic power that characterize Homer. The poet realized the difficulties of his undertaking, and had a despairing sense of his limitations. He would have spent years more on his work had death not cut him off. Yet, uncompleted as it is, it stands beside Milton and Dante as an expression of national life. The 'Æneid' is not a Greek but a Roman poem; just as the triumphal arch, in spite of its Greek column and architrave, is a Roman, not a Greek, structure.

Posterity has rejoiced that Vergil's order for the destruction of the 'Æneid' was not obeyed. The poem has its own pronounced excellences, some of them unsurpassed, and to call a thing Vergilian is to give it high praise. If any single word will in a measure express the sum of its qualities, it is the word *richness*. The natural epic is of a texture firm, warm and yielding, with simple pattern in glowing, joyous colors; the literary epic is a brocade of gorgeous, mingled hues, with strands of gold and silver inwoven in complicated pattern, so stiff it will stand alone. The 'Æneid' is especially rich. It is kept from the exuberance of Italian Renaissance art only by Hellenic restraint. It is rich in allusive content — mythological, historical, religious, archæological, literary. It is rich in story. The fortunes of its hero as a whole are no uninteresting narrative, and no tales could be more fascinating than the episodes of the fall of Troy, the loves of Æneas and Dido, the descent to Avernus, the adventure of Nisus and Euryalus. It is rich in rememberable characters. It may be that not even allowance for the divine constraint under which Æneas labored and for the ancient lack of chivalrous sentiment toward woman, to say nothing of the woman who was Queen of the Carthage one day to threaten Roman existence, can move the modern reader to more than a purely intellectual acceptance of the principal character; but even Æneas is a thoroughly consistent figure in his steadfast, sad-hearted obedience to the commands of heaven. And as for the Dido he was compelled to leave, in her Vergil has executed one of all time's most truthful portrayals of a dignified, beautiful and passionate woman wrought upon by the extremities of love and despair. This one intense

figure goes far to compensate for the lack of vividness and reality in so many of the dramatis personæ of the 'Æneid.' It is rich in the mystical and the romantic. For Dante to make the sixth book into the stage of the Inferno was natural; the sixth book is already mediæval. It is rich in love of nature and sensitiveness to beauty of every kind. No reader forgets the familiarly modern feeling for natural scenes — for the sea tremulous under the light of the moon, for the Tiber swirling to the sea between leafy banks, with wild fowl in the air all about; or misses the charm of numberless allusions in simile and metaphor to the beauty of Italy, the garden, and her sister Mediterranean lands. It is rich in pathos. "Vergilian tenderness," "the haunting melancholy of Vergil," "lachrymæ rerum," have become literary phrases. It is rich in religious feeling, in its fond looking back toward the old-fashioned gods of field and grove, farmhouse and fold, and in the yearning note always pathetically sounding when death is envisaged and the life beyond is glimpsed. "Vergil's poems," writes F. W. H. Myers, "lie at the watershed of religions. Filled as they are with Roman rites and Roman tradition, they contain also another element, gentler, holier, till then almost unknown; a change has passed over them like the change which passes over a Norwegian midnight when the rose of evening becomes silently the rose of dawn." It is rich in the personality of the poet. The emotional qualities of the 'Æneid' are felt to belong to Vergil himself. It is as if we were in the presence of the tall, dark, delicate, serious, retiring friend of Horace, the "soul than whom the earth has brought forth none more fair," and heard his earnest, melancholy tones, and felt his enthusiasm for poetry and responsiveness to the noble and the beautiful. It is rich above all in the dignity, variety, sonorousness, adaptability and spiritual suggestiveness of "the stateliest measure ever moulded by the lips of man." In other respects the 'Æneid' may be uneven; in this it is of unfailing excellence. "We shall not find," says Mackail, "that the splendour of the poem depends on detached passages, but far more on the great manner and movement which, interfused with the unique Vergilian tenderness, sustains the whole structure through and through."

The 'Æneid' may be read in the verse translations of Conington, Bowen, Morris and Dryden; or in the prose of Conington, with essay and notes by Francis G. and Anne C. E. Allinson, or of Fairclough in the Loeb Classical Library, or of Mackail. For appreciation, Sellar's 'Virgil'; Boissier, 'The Country of Horace and Virgil'; Glover, 'Virgil'; Comparetti, 'Vergil in the Middle Ages.'

GRANT SHOWERMAN,
Professor of Latin Literature, University of Wisconsin.

ÆNESIDE'MUS, ē'nĕs-ĭ-dē'mŭs, Greek philosopher, fl. 80–60 B.C.: b. Cnossus in Crete, removed to Alexandria. He was a leader of the Skeptical school and is famous for the "Ten Tropes" attributed to him,— arguments to prove the impossibility of absolute knowledge, and reducible in essence to two, that no two things are alike and everything is relative. They are: (1) That each sentient being must have a different perception and conception of the universe from every other because differently constituted; (2) that human beings differ; (3) that sense organs differ; (4) that the circumstances of perceptions differ; (5) that objects perceived differ in location and distance; (6) that different objects are confounded; (7) that different combinations make the same sensation seem different; (8) that all knowledge is relative; (9) that degrees of familiarity cause differences in perception; (10) that the intellectual speculations, moral theories, laws, manners and customs, civilizations, etc., of all races differ (Locke's argument against intuitive ideas).

ÆNIANES, ē-nī'a-nēs, in classic Greek, an Achæan people living on the southern border of Thessaly, in the mountains west of Thermopylæ; members of the Ætolian League and the Delphic Amphictyony.

ÆNON, ā'nôn, a place near Salim where John the Baptist baptized (John iii, 23). Its location is now difficult to determine. Eusebius and Jerome place it eight miles south of Scythopolis, now called Beesan. Nearly a mile south are seven springs. A place which is now called Ainun, five miles northeast of Jerusalem in Wady Farah, is thought by Barclay and Conder to be the right location. Here are a great number of rock-hewn cisterns, and a short distance south are many springs, which may seem to connect it with Ænon, a place where was "much water," or many waters.

ÆOLIAN, a musical instrument. See MUSICAL INSTRUMENTS, MECHANICAL.

ÆOLIAN DEPOSITS. See EOLIAN DEPOSITS.

ÆOLIAN HARP, or **ÆOLUS' HARP**, is generally a simple box of thin fibrous wood to which are attached a number of fine strings, sometimes as many as 15, stretched on low bridges at each end and carefully tuned so as to be in harmony. Its length is made to correspond to the size of the window or other aperture in which it is intended to be placed. Its width is about five or six inches, its depth two or three. It must be placed with the strings uppermost, under which is a circular opening in the centre, as in the belly of the guitar. When the wind blows athwart the strings it produces the effect of a choir of music in the air, sweetly mingling all the harmonic notes and swelling or diminishing the sounds according to the strength or weakness of the blast. A simpler kind of Æolian harp has no sounding-board but consists merely of a number of strings extended between two boards.

ÆOLIANS ("variegated," mixed race), an ancient Greek people, perhaps the very earliest Greek stock — a mixture of Hellenes and Pelasgi — before the special races like Ionians and Dorians had differentiated from it; as their language was not a distinct dialect like those, but is a mixture of elements from all and presents the closest link of any between Greek and Latin. The Homeric language is Æolic. The race extended from northeast to southwest through Greece, from the Pagasaic Gulf through Thessaly or at least Phthiotis, Bœotia, Phocis, Locris and Ætolia, north of

the Corinthian Gulf, to Elis and Messenia, south of it. The sons of Æsculapius (q.v.), Philoctetes, Odysseus, Nestor and the Oilean Ajax, were Æolians; and legend accredits to the same stock Jason, Melampus the healer, who understood the song of birds, Sisyphus, the founder of Corinth, and Athamas, the great King of the Minyæ, son-in-law of Cadmus and father of Phrixus and Helle. The Achæans, if not originally part of the same stock, became blent with them and are classed by the ancients as part of them; and there is no separate Achæan dialect or art. Probably they were one, and the Peloponnesian Achæi were certainly part of them; and the great emigration commonly called the Æolian was an emigration of Achæan people. It seems probable that the emigration from the Peloponnesus began before the Dorian invasion, or return of the Heraclidæ, as it is often called, which caused so great a revolution in the peninsula. Strabo says the Æolian settlements in Asia were four generations prior to the Ionian. Their colonies on the Asiatic mainland were widely spread, extending at least from Cyzicus, along the shores of the Hellespont and the Ægean to the river Caicus and even the Hermus. Many positions in the interior were also occupied by them as well as the fine island of Lesbos, with Tenedos and others of smaller importance. Homer mentions all these parts as possessed by a different people, which would be proof, if any were wanting, that the race of new settlers came after his time. There were 12 cities or states included in the older settlements in that tract of Asia Minor on the Ægean which was known in Greek geography by the name of Æolis and formed a part of the subsequent larger division of Mysia. Smyrna, one of them, which early fell into the hands of the Ionians, the neighbors of the Æolians, still exists nearly on the old spot, with exactly the same name; thus adding one to the many instances of the durable impression made by Greek colonies wherever they settled.

ÆOLIPILE, an invention of Hero of Alexandria, often called the first steam engine. It consists of a hollow metal sphere supported by trunnions, through one of which steam is admitted to the interior of the sphere. At opposite points on the sphere short tubes are inserted with their ends bent. The steam escapes through these ends and causes the sphere to revolve. Consult Gerland and Traumüller, 'Geschichte der physikalischen Experimentierkunst' (Leipzig 1899); Schmidt, 'Heron von Alexandria' (ib., 1899); Thurston, R. H., 'Growth of the Steam Engine' (New York 1878).

ÆOLIS. See ÆOLIANS.

ÆOLUS, in Greek legend: (1) Ruler of the winds; a sort of sub-deity, having his residence on a floating island, said to be one of the Æolian Islands, or by the Latin and later Greek poets one of the Lipari Islands. Here he kept the winds in bags (Vergil says in caves), restraining or letting them loose at the orders of Zeus. In the Odyssey he gives them to Odysseus to take care of for a time. (2) The eponymous ancestor of the Æolians, located in Thessaly; Hellen was his father and Dorus his brother (eponyms of the Hellenes and Dorians), and Sisyphus his son, the significance of which is not ascertainable. (1) and (2) may have been originally the same, but if so they arose as independent metaphors or eponyms.

ÆONS (from the Greek, signifying "an age," "everlasting"), a designation applied to celestial powers and spirits which, according to Gnostic philosophy, proceed from God the all-perfect Æon, the fountain-head of divinity, existed before time began and distinctively rule the successive eras of the universe, throughout eternity. See GNOSTICISM. Consult Mead, 'Fragments of a Faith Forgotten' (London 1900).

ÆPINUS, ē-pī'nŭs, **Franz Maria Ulrich Theodor,** German physicist and Prussian educator: b. Rostock, Saxony, 13 Dec. 1724; d. Dorpat, 10 Aug. 1802. From 1757 until his retirement in 1798 to Dorpat, he was professor of physics and member of the imperial academy of sciences in Saint Petersburg (Petrograd). He was a prolific author of various works on the physical sciences, chief of which are: 'Tentamen Theoriæ Electricitatis et Magnetisimi' (Saint Petersburg 1759); 'De distributione caloris per tellurem' (Saint Petersburg 1761); and a treatise on the effects of parallax in the transit of a planet over the sun's disc (1764), which created great interest. He was tutor to Prince Paul, son of the Empress Catherine II, and inspector-general of the imperial normal schools which the Empress unsuccessfully tried to establish throughout the empire.

ÆQUI, ē'kwī, an ancient people of Italy, conspicuous in the early wars of Rome. They inhabited the mountain district between the upper valley of the Anio (Teverone) and Lake Fucinus. Their origin is unknown; but they were probably akin to the Volscians, with whom they were in constant alliance. This league after the fall of the monarchy made great headway and captured many towns, their power culminating in the 5th century B.C. At length they were severely defeated by Cincinnatus in 458, and again by the dictator Postumus Tubertus in 428. They were finally subdued about 304, and soon after were admitted to Roman citizenship, being included in the new tribes Aniensis and Terentina. Henceforth their name disappears from history; but the inhabitants of the upper valleys began to be called Æquiculi, by which name they are mentioned by Vergil as predatory mountaineers. The name Æquiculani occurs in Pliny.

ÆRARIUM, e-rā'ri-um ("money-place"), the public treasury of ancient Rome; containing not only the state moneys and accounts, but the legionary standards, the public laws (on brass plates), Senate decrees, and other important papers and registers. It was located in the temple of Saturn, on the eastern slope of the Capitoline hill. Besides the general treasury, filled from general taxes and drawn on for regular expenses, there was in the same building, a "sacred treasury," or reserve fund, replenished chiefly by a 5 per cent tax on the value of manumitted slaves, which was never drawn upon except on occasions of extreme necessity. The Senate controlled the ærarium nominally even under the early emperors, who had their separate imperial treasury

called the *fiscus;* but as the Senate became a mere name, the figment of two treasuries was gradually abolished. Augustus established also a military treasury devoted solely to army accounts. The later emperors had likewise a private treasury, aside from the general one which they administered for the empire.

AERATED BREAD. See BREAD.

AERATED WATERS. See MINERAL WATERS.

AERATOR, an apparatus used in dairying for aërating milk to remove the animal and barn odors. The usual process is to run the milk in a thin layer over an exposed surface immediately after milking. In most appliances of this kind the animal heat is removed at the same time by having the exposed surface cooled with ice, ice water or cool spring water. Care must be taken that aëration be carried on in a place free from dust in order to lessen the conditions favorable to the growth of micro-organisms. The aërator itself, like all dairy appliances, must be so constructed that it may be easily and thoroughly cleaned.

AERENCHYMA, a loose, spongy tissue in plants, especially in water plants. It is supposed to facilitate aëration. Typically it is composed of radially arranged arms of thin-walled cells inclosing large air spaces.

AERIAL CONVEYER. See CONVEYER.

AERIAL NAVIGATION, Legal Aspect of. The rapid development of aerial navigation seems as yet to have produced no actual decisions upon the novel questions of private right and public regulation which sooner or later will be presented for solution. In the absence of express statute or international regulation by treaty, the principles and analogies of the common and maritime law must furnish the rule of decision. The right of an aviator to fly over another's land depends upon the true meaning and present application of the ancient maxim, "Whoever owns the soil owns also to the sky and to the depths." Literally construed and applied, any passage over another's land, at whatever height, is a trespass and therefore unlawful. On the other hand, the view is taken that this maxim is not to be applied literally, that the owner's rights in the air space above his land are appurtenant to the soil and extend only so far as is necessary to the enjoyment of the use of the soil without interference and that therefore a mere passage across his land at a sufficient height and without other interference is not an actionable wrong. It is everywhere agreed, however, that if navigation over another's premises is conducted so as to constitute a nuisance, or to result in actual damage, an action will lie. The conflict of opinion is as to whether the right of action is limited to cases of actual damage and of nuisance. An opinion fast gaining ground is that the landowner cannot be heard to complain of any use of the air spaces above his land by which no damage to him can result; that his rights above the height necessary to the full enjoyment of his land free from any interference are too unsubstantial to be protected by the law (4 Am. J. Int. L. 126, 127).

AERIAL TELEGRAPHY. See SEMAPHORE; WIRELESS TELEGRAPHY.

AERIAL TORPEDOES, the designation given to explosive missiles which are capable of propelling themselves through the air by self-contained forces. See TORPEDOES.

AERIANS, ā-ē'rĭ-unz, a religious sect who arose in the 4th century of the Christian Church and present many features of modern religious liberalism in the way they combatted ecclesiastical tradition and the institutionalism professedly derived from the apostolic age. They derive their name from their originator and leader, Aërius, a presbyter of Sebaste, a city of Pontus. Aërius flourished about 355 A.D. He was fired with a spirit of revolt against the condition of the Church as he found it. Although an ascetic of a very stern and rigid character, he was shocked at the extravagant lengths to which some of his fellow Christians carried the practice of fasting, and the claims which they made to merit because of this rigorous self-maceration. Although he found fasting a settled institution of the Church he opposed the practice because of the delusions it seemed to lead to. He was also an opposer of those special festivals of intercession which were held in behalf of the faithful departed. "Pray for the living, whose needs and sufferings some of which you may have caused," he seems to say. To this vigorous and uncompromising onslaught on the common and ordinary practices of the Church he recalls such earnest and outspoken fathers of the Reformation as Martin Luther and John Knox. There were a great many people who sympathized and agreed with him, and his sect at one time was very flourishing. The ascendancy of the episcopal order in the Church was a natural aristocratic movement, although Bishop Lightfoot in commentary on the Philippians does not seem to think that it was sanctioned either by divine command or apostolic precedent. Aërius maintained that the bishop was not superior to the presbyter, that they were of the same order, and that a bishop was merely a chairman elected for convenience sake to preside among equals. He seems also to have been opposed to holding of any such set festivals in the Church as Easter. This sect seems to have sown the earliest seed of modern Presbyterianism.

AERIDES, ā-ĕ'rĭ-dez, the wind flower, one of the *Orchidaceæ,* of which there are 15 species. The finest species, *Aerides adoratum,* grows wild in parts of Asia, but in cold and temperate climates is cultivated under glass, though flowering at rare intervals. This genus of plants derives its name from the fact that the species appear to take their principal nourishment from the air, as they can exist and thrive in their native clime, sending forth blossom after blossom while suspended and far away from any vegetable soil. They bear distichous leaves and their flowers are big and brilliant, while at the same time possessing a rare fragrance.

AERINITE, a bright blue earthy substance found in the Pyrenees. It has no definite composition, and its blue color is perhaps of artificial origin.

AERO CLUB OF AMERICA. Club organized on 16 Feb. 1910, having for its objects,

as stated in the certificate of incorporation, "the promotion of a social organization or club composed in whole or in part of persons owning aeronautic inventions for personal or private use. To advance the development of the science of aeronautics and kindred sciences. To encourage aerial navigation, conferences, expositions, congresses and contests. To maintain a club house or club houses, aerial garages, and accessories, aeronautic or otherwise incidental to the purposes or the furtherance of any of the powers hereinbefore set forth, and to do every other act or acts incidental or appurtenant to or connected with the aforesaid purposes, sports or powers, or any part or parts thereof; provided the same be not inconsistent with the laws under which this corporation is organized." The Aero Club is the sole representative in the United States of America of the Federation Aeronautique Internationale, and as such, it may grant aeronautical and aviation pilots' certificates to persons who are over 18 years of age, citizens of the United States, or citizens of a country not represented in the Federation Aeronautique Internationale.

ÆRODYNAMICS. That branch of physics which treats of forces, equilibrium and motion in a gas. It is a branch of hydrodynamics (q.v.), but differs from this latter science as applied to liquids in that it concerns itself with a compressible medium. See AIRPLANE; ÆROSTATICS; GAS; SOUND; WAVE; WIND.

AEROKLINOSCOPE, an instrument to indicate differences of barometric pressure at remote stations. It consists of a vertical axis 30 feet high, turning on a pivot, carrying at the top a horizontal arm, of which the inclination can be varied according to the difference of barometric pressure at different sides of the station, the amount of dip being indicated by a sliding rod held in position by graded notches at the lower part of the axis, each notch corresponding with one millimetre in pressure. It is used in the weather service and at military stations.

AERONAUTICAL NOMENCLATURE. The following are the principal terms which have come into use in the development of aeronautics and are new and peculiar to the subject.

Aerofoil, a thin wing-like structure, flat or curved, designed to obtain reaction upon its surfaces from the air through which it moves.

Aeroplane, a form of aircraft heavier than air which has wing surfaces for sustentation, with stabilizing surfaces, rudders for steering, and power plant for propulsion through the air. The landing gear may be suited for either land or water use.

Pusher.— A type of airplane with the propeller or propellers in rear of the wings.

Tractor.— A type of airplane with the propeller or propellers in front of the wings.

Aileron, a movable auxiliary surface used for the control of rolling motion — i. e., rotation about the fore and aft axis.

Air-Speed Metre, an instrument designed to measure the velocity of an aircraft with reference to the air through which it is moving.

Altimetre, an instrument mounted on an aircraft to continuously indicate its height above the surface of the earth.

Ballonet, a small balloon within the interior of a balloon or dirigible for the purpose of controlling the ascent or descent, and for maintaining pressure on the outer envelope to prevent deformation. The Ballonet is kept inflated with air at the required pressure, under the control of a blower and valves.

Balloon, a form of aircraft comprising a gas bag and a car, whose sustentation depends on the buoyancy of the contained gas, which is lighter than air.

Captive.— A balloon restrained from free flight by means of a cable attaching it to the earth.

Kite.— An elongated form of captive balloon, fitted with tail appendages to keep it headed into the wind, and deriving increased lift due to its axis being inclined to the wind.

Bank, to incline an airplane laterally — i. e., to rotate it about the fore and aft axis. Right bank is to incline the airplane with the right wing down.

Barograph, an instrument used to record variations in barometric pressure. In aeronautics the charts on which the records are made are prepared to indicate altitudes directly instead of barometric pressure.

Biplane, a form of airplane in which the main supporting surface is divided into two parts, one above the other.

Body of an Airplane, a structure, usually inclosed, which contains in a stream line housing the power plant, fuel, passengers, etc.

Cambre, the convexity or rise of a curve of an aerofoil from its chord, usually expressed as the ratio of the maximum departure of the curve from the chord as a fraction thereof. "Top Cambre" refers to the top surface of an aerofoil, and "Bottom Cambre" to the bottom surface; "Mean Cambre" is the mean of these two.

Capacity,

Lifting.— The maximum flying load of an aircraft.

Carrying.— Excess of the lifting capacity over the dead load of an aircraft, which latter includes structure, power plant, and essential accessories.

Centre, the point in which a set of effects is assumed to be accumulated, producing the same effect as if all were concentrated at this point.

Of buoyancy.— The centre of gravity of the fluid displaced by the floating body.

Of pressure of an aerofoil.— The point on the chord of an element of an aerofoil, prolonged if necessary, through which at any instant the line of action of the resultant air force passes.

Of pressure of a body.— The point on the axis of a body prolonged if necessary, through which at any instant the line of action of the resultant air force passes.

Chord,

Of an aerofoil section.— A right line tangent to the under curve of the aerofoil section at the front and rear.

Length.— The length of the chord is the length of the aerofoil section projected on the chord, extended if necessary.

Controls, a general term applying to the means provided for operating the devices used to control speed, direction of flight and altitude of an aircraft.

Dirigible, a form of balloon, the outer envelope of which is of elongated form, provided with a propelling system, car, rudders and stabilizing surfaces.

Non-rigid.— A dirigible whose form is maintained by the pressure of the contained gas assisted by the car-suspension system.

Rigid.— A dirigible whose form is maintained by a rigid structure contained within the envelope.

Semi-rigid.— A dirigible whose form is maintained by means of its attachment to an exterior girder construction containing the car.

Drag, the total resistance to motion through the air of an aircraft — i. e., the sum of the drift and head resistance.

Drift, the component of the resultant wind pressure on an aerofoil or wing surface parallel to the air stream attacking the surface.

Elevator, a hinged surface for controlling the longitudinal attitude of an aircraft — i. e., its rotation about the athwartship axis.

Engine, Right or Left Hand, the distinction between a right-hand and a left-hand engine depends on the rotation of the output shaft, whether this shaft rotates in the same direction as the crank or not. A right-hand engine is one in which, when viewed from the output shaft end, the shaft is seen to rotate anti-clockwise.

Fins, small planes on aircraft to promote stability; for example, vertical tail fins, horizontal tail fins, skid fins, etc.

Flight Path, the path of the centre of gravity of an aircraft with reference to the air.

Gap, the distance between the projections on the vertical axis of the entering edges of an upper and lower wing of a biplane.

Helicopter, a form of aircraft whose support in the air is derived from the vertical thrust of large propellers.

Inclinometre, an instrument for measuring the angle made by any axis of an aircraft with the horizontal.

Lift, the component of the force due to the air pressure of an aerofoil, resolved perpendicular to the flight path in a vertical plane.

Monoplane, a form of airplane whose main supporting surface is disposed as a single wing on each side of the body.

Nose Dive, a dangerously steep descent, head-on.

Ornithopter, a form of aircraft deriving its support and propelling force from flapping wings.

Pitot Tube, a tube with an end open square to the fluid stream; used as a detector of an impact pressure. More usually associated with a concentric tube surrounding it, having perforations normal to the axis for indicating static pressure. The velocity of the fluid can be determined from the difference between the impact pressure and the static pressure. This instrument is often used to determine the velocity of an aircraft through the air.

Pylon, a marker of a course.

Race of a Propeller, the air stream delivered by the propeller.

Rudder, a hinged or pivoted surface, usually more or less flat or stream lined, used for the purpose of controlling the attitude of an aircraft about its vertical axis when in motion.

Skidding, sliding sideways in flight away from the centre of the turn. It is usually caused by insufficient banking in a turn, and is the opposite of side slipping.

Skids, long wooden or metal runners designed to prevent nosing of a land machine when landing or to prevent dropping into holes or ditches in rough ground. Generally designed to function should the wheels collapse or fail to act.

Slip, this term applies to propeller action and is the difference between the actual velocity of advance of an aircraft and the speed calculated from the known pitch of the propeller and its number of revolutions.

Spread, the maximum distance laterally from tip to tip of an airplane wing.

Stability, the quality of an aircraft in flight which causes it to return to a condition of equilibrium when meeting a disturbance. (This is sometimes called "Dynamical stability").

Directional.— Stability with reference to the vertical axis.

Inherent.— Stability of an aircraft due to the disposition and arrangement of its fixed parts.

Lateral.— Stability with reference to the longitudinal (or fore and aft) axis.

Longitudinal.— Stability with reference to the lateral (or athwartship) axis.

Statoscope, an instrument to detect the existence of a small rate of ascent or descent, principally used in ballooning.

Stay, a wire, rope or the like, used as a tie piece to hold parts together, or to contribute stiffness; for example, the stays of the wing and body trussing.

Strut, a compression member of a truss frame; for instance, the vertical members of the wing truss of a biplane.

Tail, the rear portion of an aircraft, to which are usually attached rudders, elevators and fins.

Tail Fins, the vertical and horizontal surfaces attached to the tail, used for stabilizing.

Thrust Deduction, due to the influence of the propellers, there is a reduction of pressure under the stern of the vessel which appreciably reduces the total propulsive effect of the propeller. This reduction is termed "Thrust deduction."

Triplane, a form of airplane whose main supporting surfaces are divided into three parts, superposed.

Truss, the framing by which the wing loads are transmitted to the body; comprises struts, stays and spars.

Warp, to change the form of the wing by twisting it, usually by changing the inclination of the rear spar relative to the front spar.

Wings, the main supporting surfaces of an airplane.

Wing Loading, the weight carried per unit area of supporting surface.

Wing Rib, a fore and aft member of the wing structure used to support the covering and to give the wing section its form.

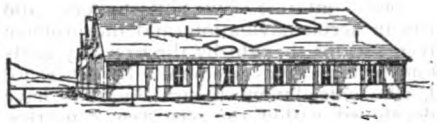
Wing Spar, an athwartship member of the wing structure resisting tension and compression.

Yaw, to swing off the course about the vertical axis, owing to gusts or lack of directional stability.

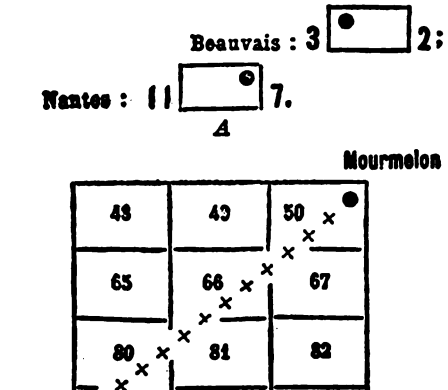
Angle of.— The temporary angular deviation of the fore and aft axis from the course.

AERONAUTIC CHARTS. The rapid progress of aeronautics demands the development of a system of signals and charts which will enable pilots to find their way in the air and indicate convenient landings, atmospheric conditions, etc. One proposed method involves the construction of special aeronautical charts; another requires merely the establishment of easily visible signals by which the pilot can find his position on the very accurate ordnance maps which are commonly used as standard maps in France and other European countries. In the French system, the country is divided into 258 districts, each of which extends about 38 miles east and west and 24 miles north and south, and is represented by a numbered section of the map.

According to one proposed system of signals, a large rectangle having the proportions of the corresponding map section and in the correct relative position to the points of the compass will be marked out on the roof of a balloon shed or other building, or on the ground. The rectangle is marked with the number of the section, and the exact position of the locality in the section is indicated by a conspicuous mark. For example, the towns of Beauvais, in section 32, and Nantes, in section



-The roof of one of the military hangars of Camp de Chalons, on which an aeroplane signal is painted.



117, would be indicated as is shown in the drawing. A glance at any one of these signals near which he passes will show the pilot the exact place on the map so that he need not be long lost or go very far astray if the signals are sufficiently numerous. A predetermined course can be followed without carrying a set of maps. It is necessary only to draw on a small card a rough outline of the sections crossed by the course and adjacent thereto to mark each section with its proper number, to mark the positions of the starting and destination points and to connect these by a straight line. A diagram for a flight from Orleans to Mourmelon is shown in the drawing. It will be observed that the straight course crosses the northwestern part of section 81. Hence, if the aviator comes to the signal shown in the lowermost portion of the drawing, which indicates a point in the southwestern part of section 81, he knows that he has deviated toward the right hand. The map is required only for the purpose of selecting a good landing place, if the goal is a large town.

If the signals are composed of white lines on a black ground, or conversely, they need not be very large in order to be visible at a considerable distance. A rectangle 12 feet broad and 20 feet long, with lines 20 inches wide and figures 6 feet in height (in actual use at Mourmelon), is easily seen from a distance of one mile and an elevation of 600 feet.

For the guidance of aviators and aeronauts at night a German inventor has devised a translucent red balloon about 8 feet in diameter, containing an electric light of 100 candles or more, and moored by means of an electric cable. These balloons are easily distinguished from other lights, and from stars, and can be seen from a great distance.

AERONAUTICS, History of. There has always been interest by philosophers and scientists in aerial navigation, and the problem was given serious thought by the first physicists of whom history gives account. To those not versed, who consider mechanical flight to have been developed within the past few centuries, it may seem surprising that principles established by Archimedes, a Grecian mathematician who lived several centuries before the Christian era, are now followed and are successfully applied in the most modern types. Students of ancient history are familiar with the mythological legend of Dædalus, Grecian sculptor, and Icarus, his companion, who made a flight with wings fashioned by the former, and which, like so many actual flights, ended in disaster. Icarus, feeling over-confident in his own ability, flew too near the sun, the heat of which melted the wax attaching the wings to his body, and precipitated him into the sea, which sea was named the Icarian Sea to commemorate the event.

The first human being whom history records as having actually risked his life in demonstrating his theories was Fauste Veranzio, who in 1617 made a descent from a high tower in Venice supported by a primitive parachute consisting of a square framework covered with canvas. There were no imitators of his methods for many years though there were many suggestions made, most of them fanciful and impracticable. Among these might be mentioned the creation of Francesco De Lana, which was to be sustained by four large hollow metal spheres, from the interior of which all the air was to be exhausted, the theory being that as the spheres were lighter than air they would float in space as does a cork upon water. It seems that even at this early period there was knowledge that air had a definite weight just as any liquid or solid, and that bodies lighter than air would rise as would a chip of wood when released under the surface of the water. These metal spheres of De Lana's were held in fixed relation by a framework of wood and a boat or body was provided with oars and sails by which it was to be propelled. While his ideas and theories on the problem were very much the same as those which determine the aerostats, or balloons of the present day, there existed obvious practical difficulties and the proposed airship remained as a rather fancifully designed drawing.

It is interesting to note at this point a form of glider constructed by Karl Friedrich Meerwin, a German architect who lived early in the 18th century, which proves that even at that date considerable was known of the law of resistance. The engineer calculated that an exposed area of 130 feet would be necessary to support a man's weight, or a weight equivalent to that of an average man, and this is a very good approximation of the truth as will be pointed out later. This inventor suggested that experiments be carried out over water to prevent serious accidents, which suggestion has been carried out in more recent years by Count Zeppelin over the waters of Lake Constance and in the experiments of Langley over the Potomac River at Washington, D. C.

Aerostats.— The discovery in 1776 by Cavendish of hydrogen gas and his proof that it was lighter than air represents the beginning of actual aerial navigation. It was natural for philosophers to conclude that if containers of sufficient dimension but little weight were filled with this gas they would rise in the air. Experiments were made by filling soap bubbles with this gas, which, however, escaped so rapidly little was learned. Then attempts were made to fill bladders and paper bags, but again the gas escaped through the pores almost as fast as it was let into them.

The credit of inventing the aerostatic airship or balloon is given to the Montgolfier brothers, Stephen and Joseph, who were the sons of a wealthy manufacturer of paper bags. These experimenters, after many trials, made a paper balloon of 700 cubic feet capacity, which was filled with smoke and heated air from a fire fed with wet straw and wool under the open mouth, and which surprised the multitude when it rose to the height of 1,000 feet. This was on 5 June 1783. Not long after this experiment Faugus de St. Fond started a subscription to raise the funds necessary to build a balloon, with the principal work of which the scientist, Charles, was interested. Through years of laboratory experience Charles was thoroughly familiar with the properties of hydrogen, and with the fact in his mind that heated air had enabled the Montgolfier brothers to ascend their balloon to a height of 1,000 feet, he concluded that by using a gas lighter than air, his success would be greater.

But the problem which he had to face was that up to that time no fabric had been made which was thoroughly airtight. Happily, just when he was experimenting with hydrogen, two brothers named Roberts discovered that it was possible to apply a coating of dissolved rubber to silk fabric and thereby secure an airtight covering. This fabric was fashioned into a balloon, and on 20 Aug. 1783, the balloon, made possible by the co-operation of the genius of St. Fond and the Roberts brothers, was filled with hydrogen and liberated. It rose to a very great height, but because of too strong inflation it ruptured and the envelope fell to the ground.

The tests thus commenced were continued by De Rozier, and Count Zambeserri, until in January 1785, Blanchard, a professional balloonist, accompanied by Dr. Jeffries, an American, drifted across the English Channel from Dover to Calais. To-day a marble column marks the spot on the coast at Calais where this historic landing was made.

The next important advance in practical ballooning was made by the substitution of coal gas for hydrogen. This was England's contribution to an art which previously had not greatly flourished west of the channel. It was a contribution following the natural growth of science, for in 1814 coal gas began generally to be used for lighting in London and several years later for inflating balloons. This valuable advance was made by the famous aeronaut Charles Green. It gave a powerful stimulus to aeronautics by rendering inflation

cheap and convenient. The first aerostat constructed on anything like our present proportions was the great balloon of Nassau which, on its initial journey, was navigated from London to Weilburg, a distance of nearly 500 miles. This was in 1836. In 1863 a still more elaborate and colossal airship was the *Géant*. It was made of a double layer of white silk, had a volume of 215,000 cubic feet and a buoyancy of 4½ tons. The *Géant* was in turn eclipsed in size by the great balloon of Henri Giffard. This measured 450,000 cubic feet and even to-day ranks as the largest captive balloon ever constructed. It was a familiar object at the Paris Exposition in 1878.

On 31 July 1901 Professor Bergson of Germany, accompanied by Dr. Suring, ascended in the balloon *Preussen* to an altitude of 10,800 metres (6.7 miles), which at present constitutes the world's altitude record. No serious attempt has been made to surpass this altitude record, for though it is easily possible to carry human beings to a greater height than seven miles, the results seem hardly to justify the cost. To ascend very much higher would require an enormous and costly balloon and to ensure the comfort of the passengers might require an airtight car, or armor, supplied continuously with fresh air or oxygen.

In recent years some of the most notable balloon flights include that of M. Goddard, who sailed from Leipzig to Wilna, a distance of 1,032 miles in 24½ hours. This was in 1897. In 1900 M. Balsan voyaged from Vincennes, France, to Rodom, Russia, a distance of 843 miles in 27 hours and 25 minutes, and De la Vaulx, starting from the same point, landed at Korosticheff, Russia, having traversed 1,193 miles in 35¾ hours. Until 1912 this remained the longest balloon flight on record. A close second to this record was made by Alan R. Hawley in his spherical balloon *America*, aided by Augustus Post, in the Gordon Bennett International Balloon Race in 1910. Sailing from Saint Louis they drifted 1,172 miles from their starting point and landed in a great forest at Peribonka River, North Lake Chilogoma, Quebec, Canada. In 1912 MM. Dubonnet and Dupont started from La Motte-Breuil, France, in the *Condor III* and landed at Sokolowska, Russia, having traversed a distance of 1,211 miles. This record was supplanted in the same year by that of MM. Bienaimé and Rumpelmayer in the *Picardie*. They started from Stuttgart, Germany, and in 48 hours landed near Moscow, Russia, after a trip of 1,361⅝ miles. Rumpelmayer made a new record on 24 March 1913 by a trip of 1,492 miles from Paris to a point near Kharkoff, Russia.

The recent advances in aerostation, though not radically changing the balloon itself, contribute much to its use and convenience. Improvements have occurred in the means of inflation and deflation, in devices for making topographical and meteorological observations, as also for transmitting and receiving signals. Hydrogen shipped in steel tubes is now available for easy and rapid inflation, the process of obtaining it on a large scale making it practically as cheap as illuminating gas.

During an ascension the rise and fall of the vessel may now be instantly noted on the dial of the statoscope, the temperature, pressure and moisture of the atmosphere may be read on the recording instruments, messages may be sent by telegraph and telephone, either by wire or without, and sky and landscape may be photographed.

Kite Balloon.— The kite balloon is a development of the captive spherical balloon, especially constructed and designed for military purposes and deriving its name from the fact that it performs the service hitherto performed by man-carrying kites. The kite balloon is sausage-shaped, with a series of ballonets at the lower end which are so adjusted that they act as stabilizers, permitting the observer's basket to remain in the air without the disastrous yawing motion which affects the basket suspended from a spherical balloon.

Power Balloons.— It is natural that after the first launching of human passengers in a crude aerostat, many schemes designed to control the course of a balloon should be evolved. The investigators of the early days fully knew that if a propelling mechanism could be made to act in conjunction with favorable aerial currents something might be effected. They knew that the wind frequently has different directions at different levels. They believed that by causing the craft to rise and fall to a suitable stratum, by use of various then known devices, it could be made to travel in any direction at the will of the pilot.

Several devices for changing the altitude of the balloon were proposed or tried. For instance, with the Montgolfier, the mere increase or lessening of the fire would cause it to rise or fall. If a gas bag were used it would be sent up or down by dropping out ballast or opening up the valve. Not realizing the enormous power required to propel swift balloons of the very best shape, and in the light of present achievement, the first efforts at a balloon propulsion as viewed to-day could not be seriously regarded by trained engineers, even at the inception of aeronautics. Historically they call for brief mention. It was in 1784 that Blanchard made the first real effort to steer a balloon, using a spherical gas balloon, provided with aerial oars and a rudder. An even simpler device was that of the two physicists Miolan and Janinet. The balloon was a Montgolfier with a large hole in one side, through which the hot air was to escape with such strong reaction as to drive the bag forward.

In 1784 the Roberts brothers made a melon-shaped balloon of silk and inflated with pure hydrogen, suspended from which was a longish car of white wood. This ship was to be rowed through the air by a crew of six by means of silken oars. A seven hours' cruise was made in the vessel, and before coming down the crew managed to have the envelope navigate a curve nearly one kilometer in radius.

While these experimentations were being carried out, even more important experiments were being made by other inventors. In 1784, in a letter written to Benjamin Franklin, Francis Hopkinson of Philadelphia proposed to build a balloon of spindle shape and to drive it by means of a wheel-like propeller. This proposed craft, the forerunner of the modern screw-driven motor balloon, antedated the screw-driven boat, the submarine and the aeroplane. In 1820 Rufus Porter, an American inventor, and later the original founder of the

Scientific American, patented an airship which was decidedly in advance of that day. Its hull was a long, finely tapering symmetrical spindle, suspending a car of similar shape by means of cords, which were vertical at its middle, but more and more slanting toward its ends. Midway between the hull and car was a large screw propeller, actuated by a steam engine in the car. The inventor, being too poor to develop his airship alone, did little with the patent during his life.

The Dirigible.— Henri Giffard was the inventor of the first dirigible which was successful both in design and operation. It was a spindle-shaped bag covered with a net whose cords were drawn down and attached to a horizontal pole, from which the car and motor were suspended, and at the end of which was a triangular sail serving as a rudder. To guard against fire, the furnace of the coke-burning boiler was shielded by wire gauze, and the draft, taken from its top through a downward pointing smokepipe, was ejected below the car by force of exhaust steam from the engine, thus obviating, as Giffard asserted, all danger from the use of fire near to inflammable gas. The car hung 20 feet below the suspension pole, and carried a three horse-power engine driving a three-blade propeller 11 feet in diameter, and making 110 turns per minute. The motor complete, including the engine and boiler without supplies, weighed 110 pounds per horse power. The bag measured 143 feet long, 39 feet in diameter and 75,000 cubic feet in volume. Giffard reports of his first voyage that although he could not sail directly against the strong wind then blowing, he could attain a speed of 6 to 10 feet per second relatively to the air, and he could easily guide the vessel by changing the rudder. Captain Charles Renard of the French War Department continued the good work of Giffard. He manifested uncommonly good judgment and excellent scientific method in combining the researches and contrivances of others with those of his own. As a consequence he produced the first man-carrying dirigible that ever returned against the wind to its starting point, and the first aerial vessel whose shape and dynamic adjustment even approximated the requirements of steady and swift navigation in a surrounding medium presenting various conditions of turbulence and calm.

In 1884 Renard, with Captain Krebs, constructed the *La France,* the success of which stimulated anew the hope of conquering the air. Its hull was 165 feet long, 27.5 feet in greatest diameter and cubed 66,000 feet. It was kept rigid under varying conditions by means of a balloonet filled with air. The car suspended from the balloon was 108 feet long and 6 to 7 feet across. It carried at its forward end the propeller, and at its rear a rectangular rudder, and between them the aeronauts, the batteries and electric motor. The motor weighed 220 pounds and developed nine horse power. The battery, composed of chlorochromic cells, was the result of researches of Renard.

While Renard was experimenting with electric power, a few German inventors were applying gas and benzine engines with better promise of practical success. The first of those was Hanlein, who in 1872 advanced the project of driving a well-shaped balloon by means of a gas engine taking its fuel from inside the balloon, and making good the loss by pumping air into the balloonet. In 1879 Bannigarten and Wolfert in Germany built a dirigible equipped with a Daimler benzine motor. The year 1898 witnessed the commencement of two famous systems of navigation by the lighter than air, one in France, the other in Germany, destined quickly to revolutionize the art and to establish it on a substantial basis. The leading exponents of these two systems were Alberto Santos-Dumont, a rich young Brazilian living in Paris, and Ferdinand von Zeppelin. Both achieved success by applying the gasoline engine to the propulsion of elongated balloons, but by very different methods.

Santos-Dumont's first dirigible was designed to carry his weight of 110 pounds and a 3½ horse-power petroleum engine taken from his tricycle and reduced in weight to 66 pounds. The hull was a cylinder of varnished Japanese silk, 82 feet long including its pointed ends, 11½ feet in diameter and 6,354 cubic feet in gas capacity. A ballonet, or air pocket, occupied the lower middle of the envelope. The basket for the pilot, engine and two-blade propeller was suspended below the hull. The poise of the vessel was controlled by shifting weights fore and aft, while the turning right and left was effected by means of a silk rudder stretched over a steel frame. This dirigible demonstrated that it was possible readily to guide an airship, but upon descent the envelope folded up like a pocket knife. Santos-Dumont continued his pioneer work until he encountered the rivalry of great wealth employing highly trained engineering and constructive talent. But he continued to do excellent work for the popularizing of the science. Santos-Dumont's experiments were continued by Le Baudy, the most notable of whose ships were the *Le Baudy, La Patrie, Morning Post* and the *Ville de Paris.* The Zodiac Company, under the compelling energy of Count de la Vaulx, furthered the work by the production of the *Zodiac I, II, III* and *IV.*

During all of these developments English and American authorities pursued a policy of interested waiting, watching the progress and hoping to benefit by the costly experimenting of the others. In 1909, however, the British government appropriated nearly $400,000 for aeronautics, and the United States House of Representatives voted $500,000, but promptly reversed its action. Considerable progress was made in England subsequent thereto through the monetary stimulus offered by various London newspapers.

The United States War Department, in 1908, started an aerial squadron by purchasing from Thomas S. Baldwin for $10,000 a tiny airship of the flexible type. It had a rubberized gray silk cylindrical hull slightly tapering toward the rear and terminating in ogival ends, its length being 96 feet, its major diameter 19½ feet.

Coincidentally much work was done in Germany. The work done there by Von Zeppelin really commenced in 1898, when he formed a limited liability company for the purpose of developing a new type of dirigible which he had long contemplated. In the summer of 1900 he

brought forth from his floating laboratory on Lake Constance the first of his airships.

Through disaster after disaster and grievous hardships, Count Zeppelin pushed his work from 1900 to 1910, when he had his first passenger machine ready. The maiden voyage of this first air liner was a marvel to the fortunate few traveling in such celestial style. Great progress was made between 1910 and 1914 and at the outbreak of the European War the Zeppelin was one of the most potential elements of Germany's air fleet.

Aeroplane, The.* The art of aeroplane flight presents two main groups of fliers. The first comprises the various man-kites, parachutes, gliding machines, soaring machines. These may be called passive fliers, because they carry no motive power, but ride passively on the air by the force of gravity or a towline. The second group comprises the bird-like flapwing machines called "orthopters"; the screw-lift fliers called "helicopters"; the aeroplanes, also called monoplanes, biplanes, triplanes, according to the number of superposed main lifting surfaces; and lastly the gyroplanes, whose sustaining surfaces may turn over and over, like a falling lath, or whirl round and round, like a boomerang. These may all be called dynamic, or power, fliers.

Disregarding the crude essays at human flight, recorded in the early histories and literature of many peoples, we may notice first the well-authenticated sketches of Leonardo da Vinci. His fertile mind conceived three distinct devices for carrying a man in the air. But he and his successors for nearly four centuries could do little more than invent. For lack of motive power they could not navigate dynamic fliers, however ingeniously constructed. Da Vinci's first design provided the operator with two wings to be actuated by the power of both arms and legs. His second design was a helicopter; an aerial screw 96 feet in diameter was to be turned by a strong and nimble artist who might, by prodigious effort, lift himself for a short time. His third scheme of flight was a framed sail on which a man could ride downward, if not upward.

Mr. Henry Woodhouse, one of the foremost aeronautic authorities, author of the 'Textbook of Naval Aeronautics,' and the 'Text book of Military Aeronautics,' has summarized the work of pioneer experiments in aeronautics as follows: History has a list of some two-score of experimenters who tried to develop power flight, among whom were: Sir George Gayley, an English inventor, whose writings (1809–10) show that he was first to plan dynamic flight on a scientific basis. He planned an aeroplane built with slightly oblique planes, resting on a wheeled chassis, fitted with propellers, motors and steering devices. Samuel Henson, another English inventor, in 1843, patented what was designated as an "aerial steam carriage," an aeroplane of immense size, which was to be used for passenger carrying. This carriage was never built. Another English scientist, F. H. Wenham, improved on Henson's idea, and in 1867 developed a multiplane. This model was taken up by another inventor, M. Strongfellow, who reduced the number of planes to three, making a triplane, which he fitted with a tail and two propellers. This model was shown at the exhibition of the Aeronautical Society of Great Britain in 1868. As in the case of previous inventors, nothing in this model indicated that he had any comprehension of the principles of stability or knowledge of the lifting capacity of surfaces, or of the power required for dynamic flight. Strongfellow deserves, however, much credit for building a very light motor, one of sufficient lightness to support a well-designed aeroplane. In 1872, a French inventor, named Alphonse Penaud, constructed a small monoplane. It was only a toy — two flimsy wings, actuated by a twisting rubber, but had fore-and-aft stability, something that most of the creations of the time lacked. Subsequently, in 1875, Penaud took out a patent on a monoplane fitted with two propellers, and having controlling devices. But this was not built, principally because it would have required a light motor, and the lightest available at the time weighed over 60 pounds per horse power, or 20 times the weight of the motors of to-day. Louis Pierre Mouillard, a Frenchman, having observed that large birds in flight, while seeming at rest, could go forward against the wind without a stroke of the wings, constructed a number of gliders, built on the principle of bird wings, and experimented with gliding. In 1881, he published a valuable work entitled 'L'Empire de l'Air,' which inspired many of the latter experimenters. Subsequently he invented a soaring machine, which he patented in 1892.

Pioneers of Modern Aviation.— These early experimenters laid the foundations of modern aviation. They showed the supporting power of their rigid surfaces, defined the general shape and structure of the aeroplane, and prepared the work for the next generation, which was to perfect these, and find ways and means to make the aeroplane rise from the ground and maintain equilibrium in the air. This new generation came toward the close of the 19th century. These new men, the pioneers of modern aviation, were divided into two schools. The first sought to achieve soaring flight by means of kitelike apparatus, which enabled them to soar in the air against winds, their machines being lifted up and supported by the inertia of the air as kites are. The second sought to develop power flight, that is, to send their kitelike machines through the air at high speed, being tracted or propelled by revolving screws actuated by motor power. The most eminent experimenters in the first schools were Otto Lilienthal, who was the chief expounder of gliding flight; P. L. Pilcher, an English follower of Lilienthal; Octave Chanute, an American follower of Lilienthal, and J. J. Montgomery, an American experimenter. Lilienthal, a German, was the first to make gliding flight a science, and he first defined the value of arched wings, and the amount of pressure to be obtained at various angles of incidence. He met with untimely death while experimenting in 1896. Chanute's experiments were in the line of Lilienthal, but his great contribution was his early encouragement of the Wrights, although the Wrights did not succeed by adopting Chanute's theories.

The leaders of the second school, who actually built and tried power-driven aeroplanes,

*For a detailed discussion see AEROPLANE.

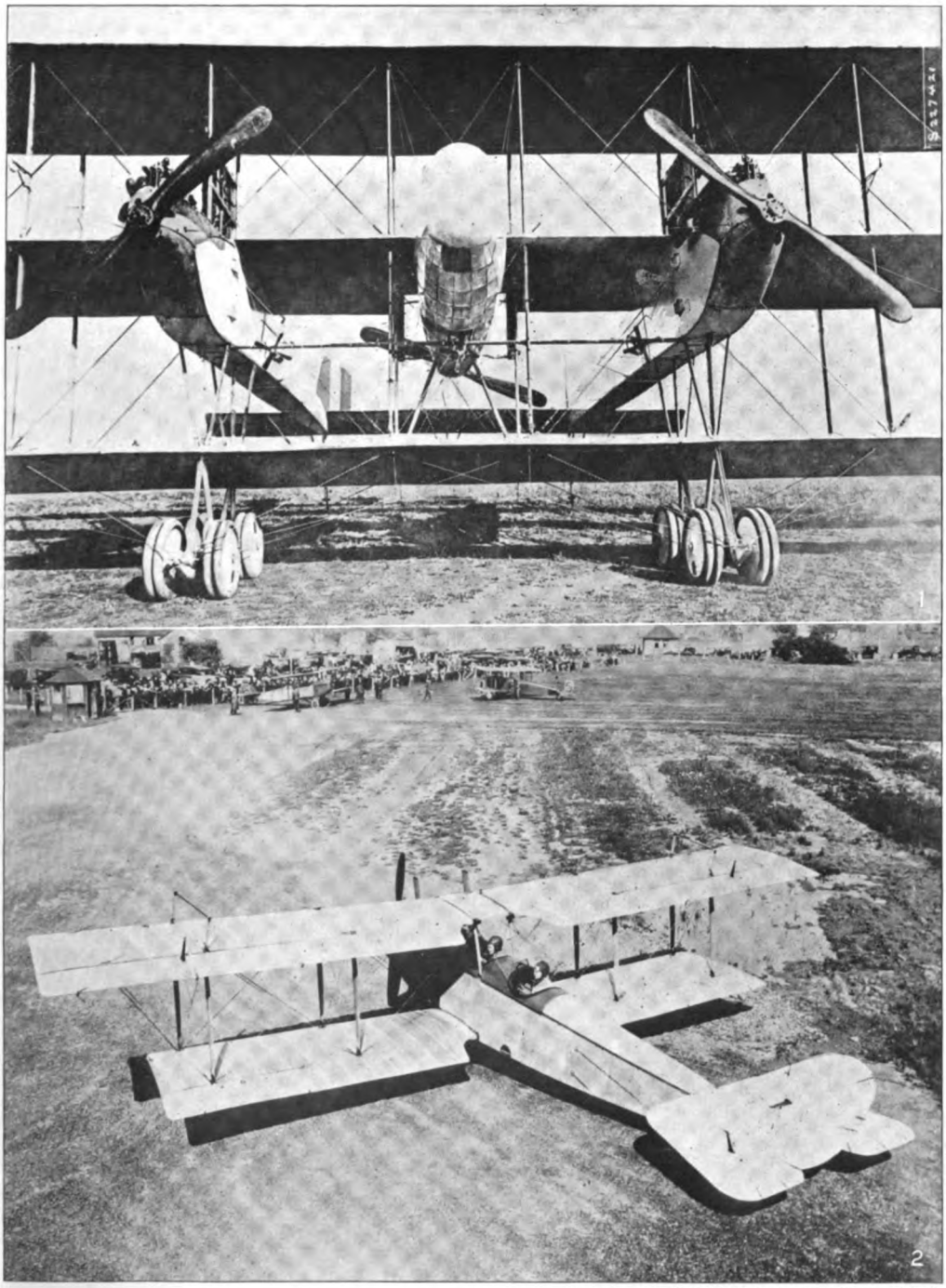
were Clement Ader (1890–97); Sir Hiram Stevens Maxim (1890–94) and Samuel Pierpont Langley (1895–1903). Clement Ader was the first to construct an aeroplane large and powerful enough to carry a man, and the French government considered the craft of immense value and employed him to build some for the army, but as each of the two experiments toppled over at the trial and wrecked, the government refused to further finance the enterprise. While Ader was making his experiments in France, Sir Hiram Maxim was at work constructing a large multiplane for the English government, which he fitted with two steam engines of 175 horse-power. But like Ader's experiment, it toppled over at the first trial and was badly damaged, and the British government refused further backing. The experience of Samuel Pierpont Langley in America is not unlike the experience of Ader in France and Maxim in England. He was employed by the Board of Ordnance and Fortification of the United States army to construct the «Aerodrome» of his own invention. Congress appropriated $50,000 for the purpose. Langley's machine was a tandem monoplane, 48 feet from tip to tip and 52 feet from bowsprit to the end of its tail. It was fitted with a 50 horse-power engine and weighed 830 pounds. The trials of his aerodrome, two attempts to launch it, were made on 7 Oct. and 8 Dec. 1903. On both occasions the aerodrome became entangled in the defective launching apparatus, and was thrown headlong in the Potomac River — on which the launching trials were made. Following the last failure, when the aerodrome was wrecked, the press ridiculed the whole enterprise, and Congress refused to appropriate money for further experiments. The Langley aerodrome, partly reconstructed and fitted with a Curtiss motor and Curtiss controls, flew in 1913–14.

As with the experimenters of the first school, they did not attain practical results. Their machines were usually wrecked at the first trial without giving any clue to the nature or whereabouts of the trouble. Just how much each of these contributed toward the final success it is hard to say. The matter has not yet been defined, and, possibly, only one man — Orville Wright — is qualified to say. Most of these men made valuable additions to the knowledge of the science, but all of them mixed the practicable with the impracticable in such a way as to make it risky to adopt their conceptions as to the basis of actual flight, a fraction of error being enough to spoil the unity of truths that must be present, and so to end an experiment in a catastrophe. Wilbur Wright, having made exhaustive tests and dissected the theories and notions of all these pioneers, knew the exact worth of each. He could have made the valuation, but died before he had done so. In a paper on Lilienthal, which he wrote for *Flying* a few days before his death, he defined the causes of previous failures, and made a general rule by which all could be judged and their works valued. The realization of power flight was thus left to the 20th century — and to the Wright brothers. In view of the complex problems to be solved, this achievement was stupendous.

Wilbur Wright and his brother, Orville Wright, two men of remarkable characteristics, sons of the Rev. Milton Wright, were presented in their boyhood, 30 odd years ago, with a toy helicopter, a butterfly-shaped contrivance, consisting of paper wings fitted with a tin propeller which, when made to revolve by twisted rubber, caused the toy to shoot forward through the air. That toy fired their imaginations, and they saw it, in magnified form, capable of carrying a man.

Their attempt to fly large helicopters constructed on the idea of the toy did not bring practical results, and until 1896, they did not give the matter of artificial flights more than passing attention. In the summer of that year, however, the news of the accident and death of Otto Lilienthal, the German champion of gliding flight, stirred them to action, and they set themselves to study aerodynamics and the works of Lilienthal, Mouillard, Chanute, Maxim and Langley, the most prominent experimenters at that time. Their experiments with a glider began in the fall of 1900 at Kitty Hawk, N. C. There, on the barren sand dunes of North Carolina, these two intrepid investigators took all the theories of flight and tried them one by one — only to find, after two years of hard, discouraging work, that they were based more or less on guesswork. Thereupon they cast aside old theories and patiently put the apparatus through innumerable gliding tests, ever changing, adding, modifying — changing again and again, advancing inch by inch, until they had, at last, developed a glider wonderfully exact, which, when fitted with a light motor, also built by them, made initial flights on 17 Dec. 1903, of from 12 to 59 seconds' duration. This, then, was the birth of the aeroplane, the flimsy, iconoclastic thing which seems to evade Newton's laws, eliminates frontiers and promises to expand civilization as much as have the steamship, the railway and electricity.

The Wrights' Success Created New Interest.— The Wrights did not make their achievements public at the time; in fact, until 1908, they flew only in private. But the report of their wonderful achievement, nevertheless, went far and wide, and stimulated those who had given up experimenting and inspired others to take up experiments. Octave Chanute, in 1902, went to France and related the early successes of the Wrights with their glider, and described the general shape of the Wright machine. The result of this trip was that half a dozen enthusiasts, including Louis Bleriot, Capt. Louis Ferber, Ernest Archdeacon, and later the Voisin brothers and Albert Santos-Dumont took up the work, thus founding the mighty French school which has increased so greatly and done so much since. The first of this school to succeed was Santos-Dumont, the Brazilian aeronaut sportsman. He constructed a machine of original design, and in 1906 made short sustained flights of from 50 to 700 feet in straight line, which created a world-wide sensation at the time. Meantime others of the French school graduated and won honors. The Voisin brothers turned constructors and teachers, and with their co-operation Leon Delagrange, Henry Farman, Louis Bleriot and other prosecuted practical experiments and succeeded in getting their creations to leave the ground for modest flights. At this juncture,



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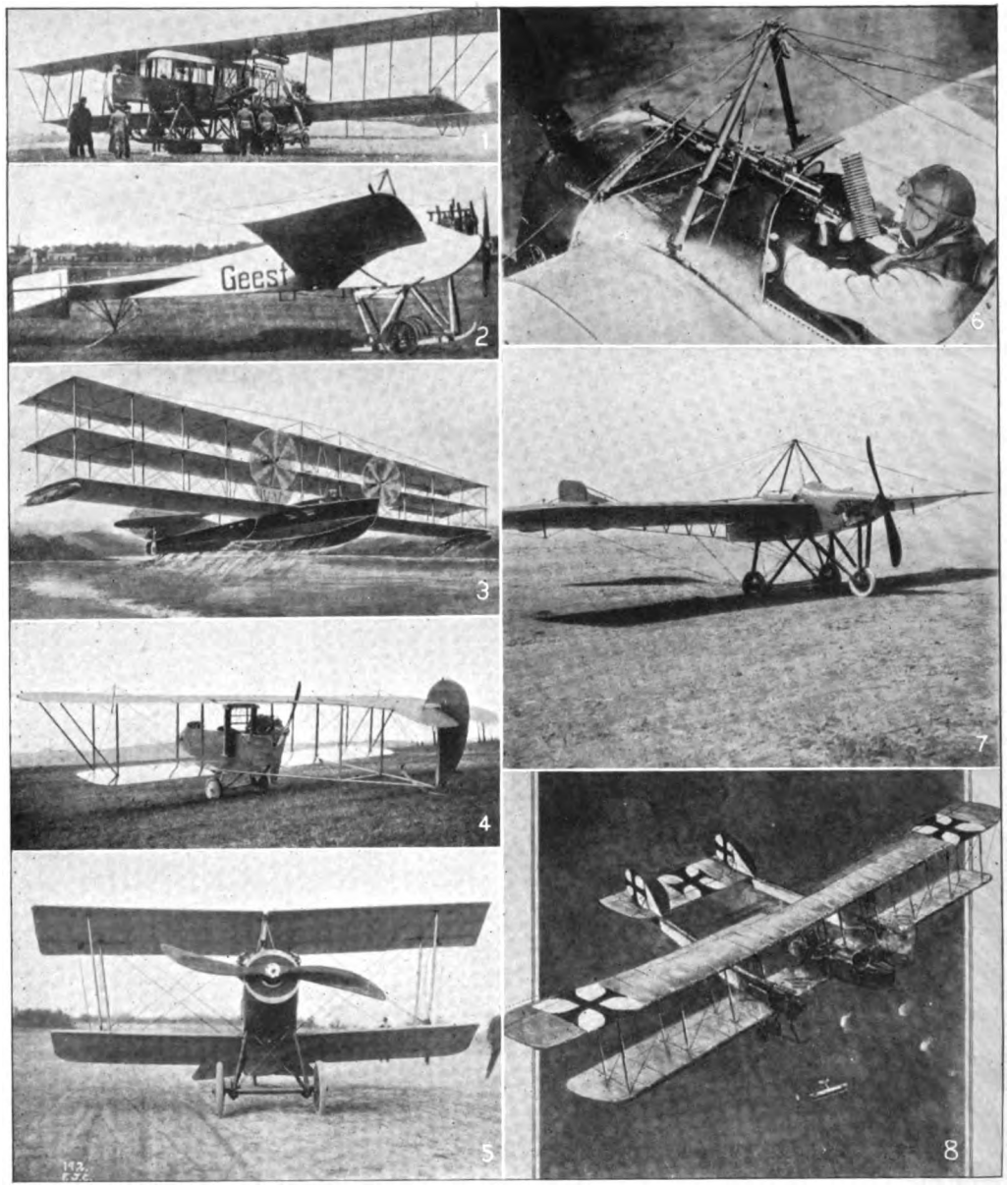
1 Caproni Italian Triplane. Flies 90 miles an hour; carries 9 machine guns and 25 passengers
2 Curtiss Biplane, for use by the United States on the French front

AEROPLANES



1 Sikorsky Aerobus
2 The Geest-German Monoplane
3 Curtiss Triplane
4 Burgess Military Pusher
5 High Speed Scout Machine
6 Morane Monoplane
7 Wiegandt's 3-seater Monoplane
8 The German Fritz Biplane

in the summer of 1908, the Wrights started out to give public demonstrations, and their methods supplied and suggested to the French experimenters the means to modify and improve their aeroplanes, particularly the means of balancing them, which had, until then, been a perplexing problem. Some months before this some American enthusiasts had combined under the auspices of Mr. Alexander Graham Bell, the inventor of the telephone, and Mrs. Bell, and organized the Aerial Experiment Association. Glenn H. Curtiss, one of the experimenters, developed a suitable type of aeroplane, and in 1908–09 became proficient in piloting it, and founded a school which did much in the following years to popularize and develop aviation in America. Consult Zahm, A. F., 'Aerial Navigation.'

The progress in aerial locomotion from 1909–14 was very rapid in Europe — especially in France and Germany — but slow in America on account of lack of the governmental stimulus which prevailed in Europe. But even in America the progress between 1909 and 1914 was important, especially in the field of marine flying, in which field America is likely to retain its supremacy. The great stimulus to aviation throughout the world came with the outbreak of the European War. The work of aircraft in the war has been of supreme importance. The co-operation of aeroplanes with artillery has proved extraordinarily effective. Of purely fighting aeroplanes, when the war began there were none — after two years there are machines weighing 10 tons, carrying a ton of ammunition, rapid-firing machine-guns and heavy guns — literally aerial cannon.

Large airships in the war have proved disappointing when compared with the aeroplane, because they are in a cruder state of development. They have almost the size of a battleship, offering a large target, without the battleship's armor or guns. The seaplane has had many achievements to its credit in the naval operations and the types which will be equipped with aerial torpedoes will constitute a real dynamic force in the future. The development of aerial locomotion during 1914–16 has exceeded the expectations of the most sanguine enthusiast — no man can prophesy what the next decade will produce. See AEROPLANE DISTANCE AND SPEED RECORDS; AEROPLANE ALTITUDE RECORDS; AERONAUTICAL NOMENCLATURE.

G. DOUGLAS WARDROP,
Managing Editor Aerial Age.

AERONAUTICS, Military. See MILITARY AERONAUTICS.

AEROPLANE (from the Greek *aer,* air; *planos,* wandering), a term now commonly used to define a "heavier than air" flying machine equipped with fixed aerofoils or main supporting surfaces and driven by suitable motive power.

Principle.— Everyone nowadays is familiar with the appearance of an aeroplane, but many there are, nevertheless, who do not know what, scientifically speaking, an aeroplane is. They see the machine on the ground; they observe someone giving frantic tugs at something that moves in jerks; they hear a roar, which they know must come from an engine; they perceive that, in starting, the machine runs for a while along the ground before rising gently into the air; but still they do not know why the aeroplane flies.

It has something to do with the wings, of course, but how? That is the question at which the average lay mind stops short, not for ability to understand the problem, but generally for lack of some appropriate explanation that will bring what is fundamentally a very simple phenomenon out of its proper sphere of aeronautical science into the realm of everyday things that are comprehended by common sense.

There is an elusive aspect of the general view, and only one, that is apt to hide itself from the uninitiated unless brought prominently into the full light of the mind in the very first instance and that is the significance of a simple scientific expression much used in aviation, namely, "relative motion." If the man in the street saw an aeroplane apparently standing still in the air it would not occur to him to think that the machine must be flying through the wind at its full speed and that its relative motion in the air is quite unaffected by its motion relatively to the ground on which he is standing. Yet the same man knows very well that if he starts running on a calm day he will feel a slight breeze in his face, which is solely the result of his own relative motion through the air. He is also aware that if he puts his head out of an express railway car he will encounter half a gale of wind notwithstanding that the leaves of the trees may show not so much as a tremor. If, instead of putting his head out of the window, he were to take a sheet of stiff cardboard and put that outside he would have a still more practical demonstration of the force of the relative wind which supports the aeroplane in its flight. If the train is moving fast the cardboard will exhibit a violent tendency to flap upwards and downwards with the least variation from its truly edge-on horizontal position. It is at this point that the embryo scientist begins to think really hard. His mind perceives an unsuspected fact that he senses to be of great importance. He has observed that by slightly raising the front edge of the piece of cardboard so that it is at a slight angle to its line of motion, instead of being truly edge-on, an extremely strong lifting force acts on the cardboard, although its resistance to the air is but little more than it was when the cardboard was edge-on. So pronounced is the preponderating value of the lifting effort over the resistance at very small angles that anyone making this experiment would at once conclude that if he wished the wind to support a weight he would certainly arrange some sort of a surface beneath it, like a table, but tilted so as to have only a slight angle of inclination to the line of its flight through the air.

An aeroplane has its table-like supporting surfaces so arranged as to get the best lifting effect for the least effort, having regard, of course, for the conditions under which the machine is designed to fly. It is clear, merely from a glance at a number of aeroplanes, that they are not all exactly alike in this respect, but it will be noticed that they all have one point in common which is that the surface

instead of being flat is cambered or slightly bellied like the sail of a yacht. This is an important analogy because a yacht is one of those commonplace objects that are so familiar that the man on the shore never stops to ask himself whether or not he understands how it sails. It will be the same with the aeroplane in a few years' time, which is why it is worth while troubling to appreciate an explanation now in order that one really may be informed as to the essential facts by the time aviation, in common with so many other interesting things, becomes veiled under the ever-spreading pall of public indifference. The sail of a yacht is an aeroplane in principle but its use differs materially from the purpose of the wing of an aeroplane. When the wind blows obliquely on the sail of a yacht the pressure that it exerts is mostly directly toward capsizing the boat, but owing to the set and camber of the sail the force is also directed slightly forward toward the bows and the amount of this component is sufficient to propel the boat. If a real wind were to blow obliquely from beneath on the wing surface of an aeroplane the same propelling effect would be produced and the main force that tends to capsize the yacht would be turned to the useful purpose of supporting the weight of the machine, which would continue to fly without using its engine so long as the conditions remained appropriate.

At this point let us become familiar with the idea of power in connection with flying. When the wind blows it often possesses enormous power and when it blows suitably against a windmill or the sail of a yacht or the wing of a bird, it may transfer some of its energy into mechanical movement as grinding, sailing, and flying, respectively, in the three instances cited.

When the air itself does not move, or does not move in a suitable way to enable the transformation of its energy into soaring flight, the power necessary to the continuance of flying must be supplied by the object which flies. The bird flaps its wings, the aeroplane starts its engine. There may be little resemblance between the action of a bird's wing and that of the propeller which is driven by the engine of an aeroplane. Scientifically, there is a close analogy between them. One of nature's masterpieces is the perfect articulation of the joints of an anatomy that permits such smooth-acting to-and-fro movement as is manifested by the legs of an animal when walking and of a bird's wing when in flapping flight. Reciprocating motion is anathema to engineering, but the engineer finds a great compensation in the principle of rotation, and wherever it is possible to do so the mechanism of mechanical power is confined to the continuously revolving shaft. Thus, on an aeroplane, you find an engine which generates the power, a revolving shaft, which transmits the power, and a propeller on the shaft, which transforms the power into thrust or traction, and so pushes or pulls the engine as a whole through the air.

Power is essential to flight, but when the engine stops in mid-air the aeroplane does not fall to the ground, nor is the pilot in any need of a balloon. The aeroplane itself, when properly designed and flown, possesses an inherent quality that is better than any artifice, and without which flying by aeroplane would be quite out of the question.

The principles of aeroplane propulsion and sustentation are shown graphically in Fig. 1. The case considered is that of a biplane. A single large propeller serves to pull the machine in the direction of flight and the air immediately ahead of the machine, being displaced by the action of the propeller, flows backward horizontally at high velocity and presses against the under surface of the aerofoil.

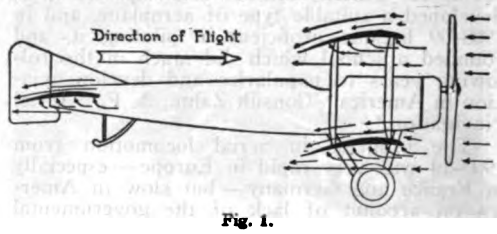


Fig. 1.

The following tables, giving the air resistance and corresponding horse-power and the air pressure at different velocities, will be found of value in calculations pertaining to the designing of any class of aircraft:

TABLE I.— AIR RESISTANCE AND HORSE-POWER

Miles per hour	Feet per second	Horse-power per sq. foot
10	14.7	0.013
15	22	0.044
20	24.6	0.105
25	36.7	0.205
30	44	0.354
40	58.7	0.84
50	73.3	1.64
60	87.9	2.83
80	117.3	6.72
100	146.6	13.12
120	161.3	16.98

TABLE II.— AIR PRESSURE PER SQUARE FOOT

Miles per hour	Feet per second	Pressure per sq. foot
10	14.67	.492
25	36.6	3.075
50	73.3	12.3
70	102.7	24.103
100	146.6	49.2
120	161.3	63.3

The effect of varying areas and forms of planes is marked, and with planes of different form but of the same area results are obtained which are so different as to be the cause of comment. There is no question that the form of the wing of the bird gives proportions which can be followed in the aeroplane with good results. This means that the best results will be obtained with a plane which is wide when viewed from the front and short when seen from the side. The exact proportions have never been definitely determined, and vary in all of the successful creations, but it was determined by Professor Langley that a plane with a wide advancing edge was the most efficient, not only by calculation, but by actual experiments. His tests were made with various forms and areas of planes, and for illustration it will be said that a plane with an advancing edge or width of six inches and a length of 18 inches, when moving at a horizontal velocity of 65.61 feet per second, or at the rate of 45 miles per hour, as shown in Fig. 2, A fell vertically four feet in seven-tenths of a second. On the other hand a plane with an advancing

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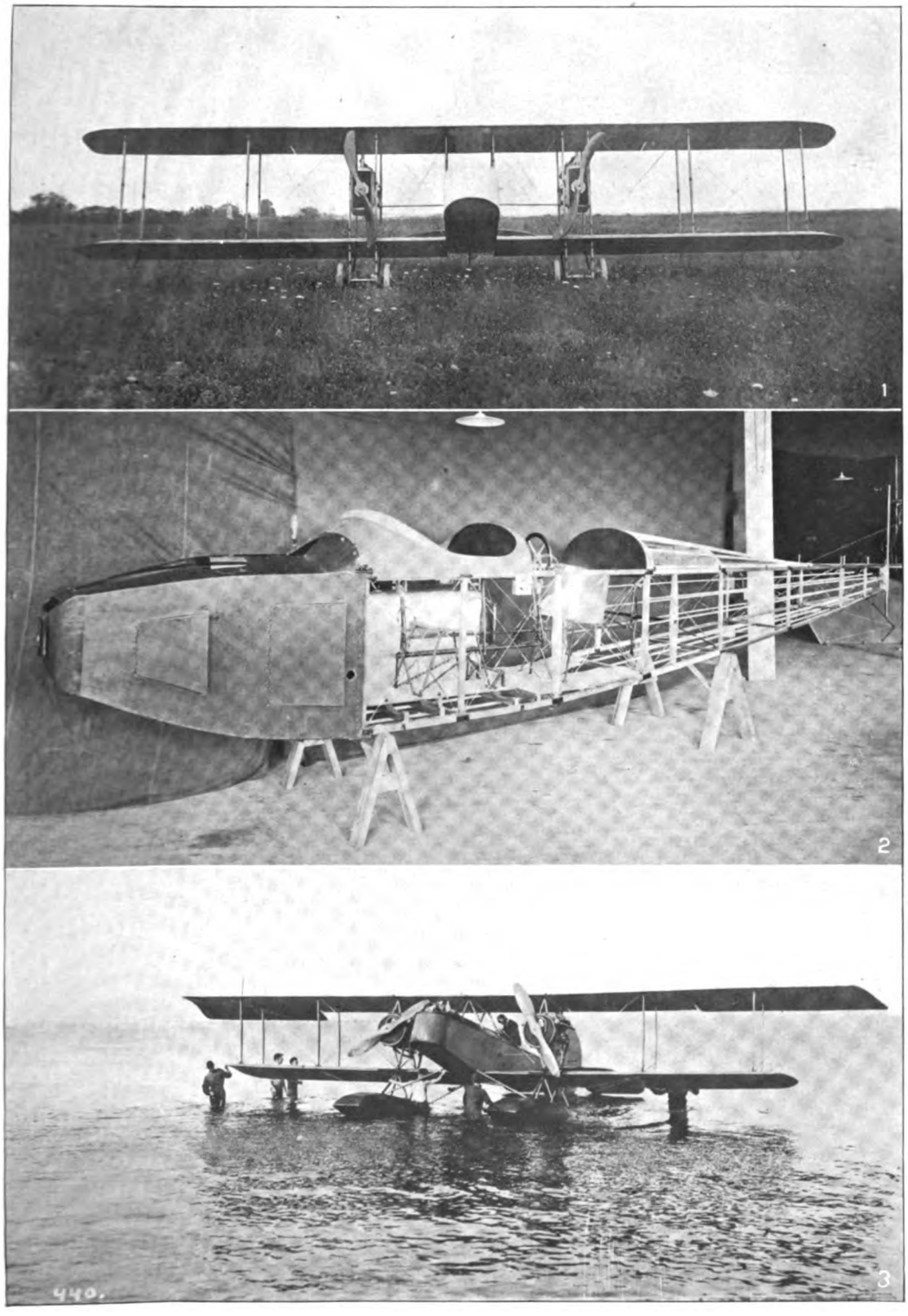
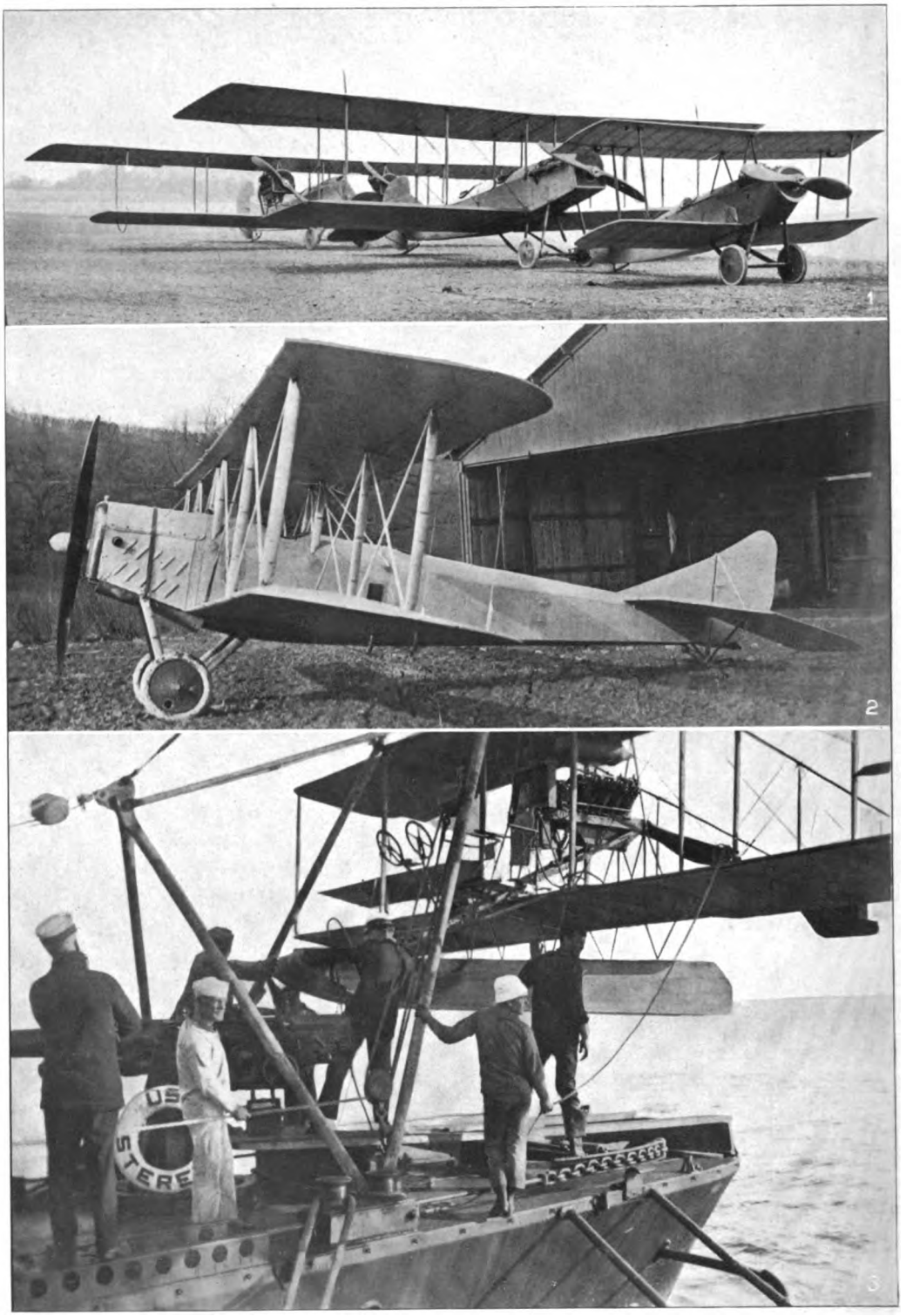


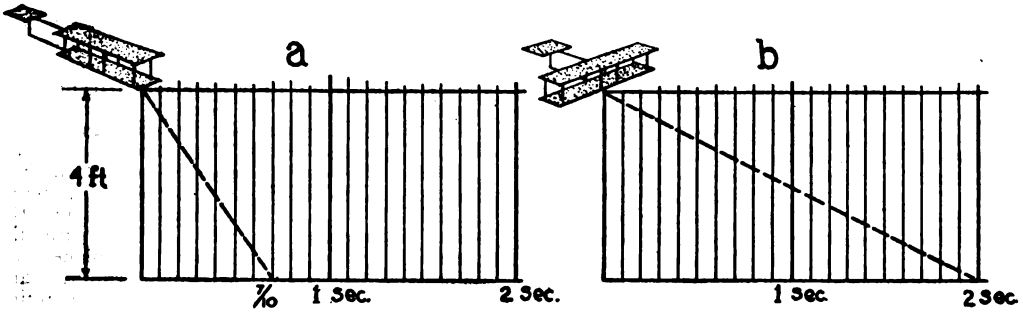
1 Twin-motor biplane 2 Fuselage and seating arrangement of a two-seater aeroplane 3 Twin-motor hydroplane

AEROPLANES



1 Twin-propeller, two-seater and single-seater biplanes
2 Thomas military tractor
3 Hoisting aeroplane on board a destroyer

edge of 18 inches and a length of six inches, obviously having the same supporting area as the other, and moving at the same velocity, fell four feet vertically in two seconds, demonstrating that the sustaining power of the form shown in B was about three times as great as that of the form with the narrow advancing edge.



Aeroplane with narrow advancing edge.

Aeroplane with wide advancing edge.

Constructional Features.— Like birds, aeroplanes possess bodies, wings and tails; they also have undercarriages that serve the purpose of legs when alighting. The class of machine that most closely approximates to the bird type is the typical monoplane; biplanes often have no resemblance whatever, in appearance, to nature's best flyers. The technical difference between a monoplane and a biplane, however, is merely that a monoplane, in common with the bird, possesses only one pair of wings, while the biplane is provided with two main supporting surfaces, one situated above the other.

There is apt to be considerable confusion about the use of the term «length» when applied to aeroplanes, owing to the fact that wings fly through the air broadside-on. It is natural, when speaking of the wings alone, to refer to their longest dimension as their length, as one would do when speaking of any other object; but, when the machine is in flight, one might equally remark how short is the length of the wings compared with that of the machine as a whole, meaning thereby the measurement of the wing from its leading edge to its trailing edge. For this reason it has become customary to apply the terms «span» and «chord» in this connection, and having an obvious derivation they justify their existence as technical words and are deserving of general use. One speaks of the span of a bridge and chord of the arc of a circle; both expressions have an analogous significance in reference to the aeroplane.

Thus, the wings, which are the supporting members of the machine, form a kind of bridge that spans the air in order to hold aloft the weight; the wings themselves, as has already been mentioned, are cambered so that a string stretched between the leading edge and the trailing edge would occupy the position of the chord to the arc that is formed by the wing surface. This arc, by way, is not circular, but is of such contour as is found best by experiment on models that are tested in an experimental wind tunnel. The highest point of the curvature of any wing section is always nearer the front edge than it is to the trailing edge. Two of the most important accessory features of the supporting planes are the elevator and the rudder. Since the aeroplane sails in, instead of on, the aerial sea, it must be equipped with two sorts of rudder, one for steering to the right and left in the ordinary way, and another for steering up and down. The latter we now call an elevator in order to avoid confusion of terms; actually it is merely a pivoted plane just like a rudder, but arranged horizontally instead of vertically. In a monoplane, the rudder and the elevator form part of the tail of the machine. The term «tail» applies to a group of organs of which the two just mentioned are hinged and movable to perform the directional functions under the pilot's control. A third plane horizontally arranged like the elevator, but rigidly fixed, is commonly added in order to confer some degree of natural «longitudinal stability» in flight. In those aeroplanes that have long boat-like bodies extending the full length of the machine, this fixed tail plane is often a mere fin-like excrescence. On other types, however, the rigid portion of the tail is a much larger affair; in either case, it commonly carries the elevator as an extension in the form of a hinged flap. Instead of flapping its wings, to do which would involve constructional difficulties, the machine carries a propeller. This is usually a two-bladed unit built of timber, and it usually measures about eight feet or more in diameter. Owing to its high speed of rotation, which commonly is between 1,000 and 1,300 revolutions per minute, the propeller is invisible in some of the machines that are photographed in flight. It is common practice to put the propeller in front and to mount it upon the engine crankshaft. A general study of the designs of the machines makes it very clear that the forward position — or «tractor» screw as the propeller in front is often called — is structurally convenient. Monoplanes were from the first designed with long girder-like bodies, which necessitates a single air screw being placed either in front of the wings or behind the tail. When this form of body became more common on biplanes the tractor screw accompanied it. There exists a wide difference of expert opinion regarding the most effective plane area. Some of the most efficient aerofoils (consult Loening, 'Military Aeroplanes') have been developed by the Frenchman Eiffel. Experiments at the Royal Aircraft Factory in England have also been productive of some interesting wing surfaces and more recently tests made for the Signal Corps of the United States

army at the Massachusetts Institute of Technology have developed some interesting facts concerning aerofoils. It is well recognized, however, that the matter of plane area is largely governed by the factor of velocity, and that slow speed machines require larger aerofoils than those operating at higher velocities Since slow speed is not a desirable qualification of aircraft in general, and tends to influence the angle of incidence, thus increasing the air resistance and requiring the employment of excessively high driving power, the general constructive effort is being directed to the production of high speed machines having small aerofoils and powerful engines, the velocities commonly attained ranging from 65 to 150 miles an hour, with a speed of 180 miles an hour an easy probability in the near future.

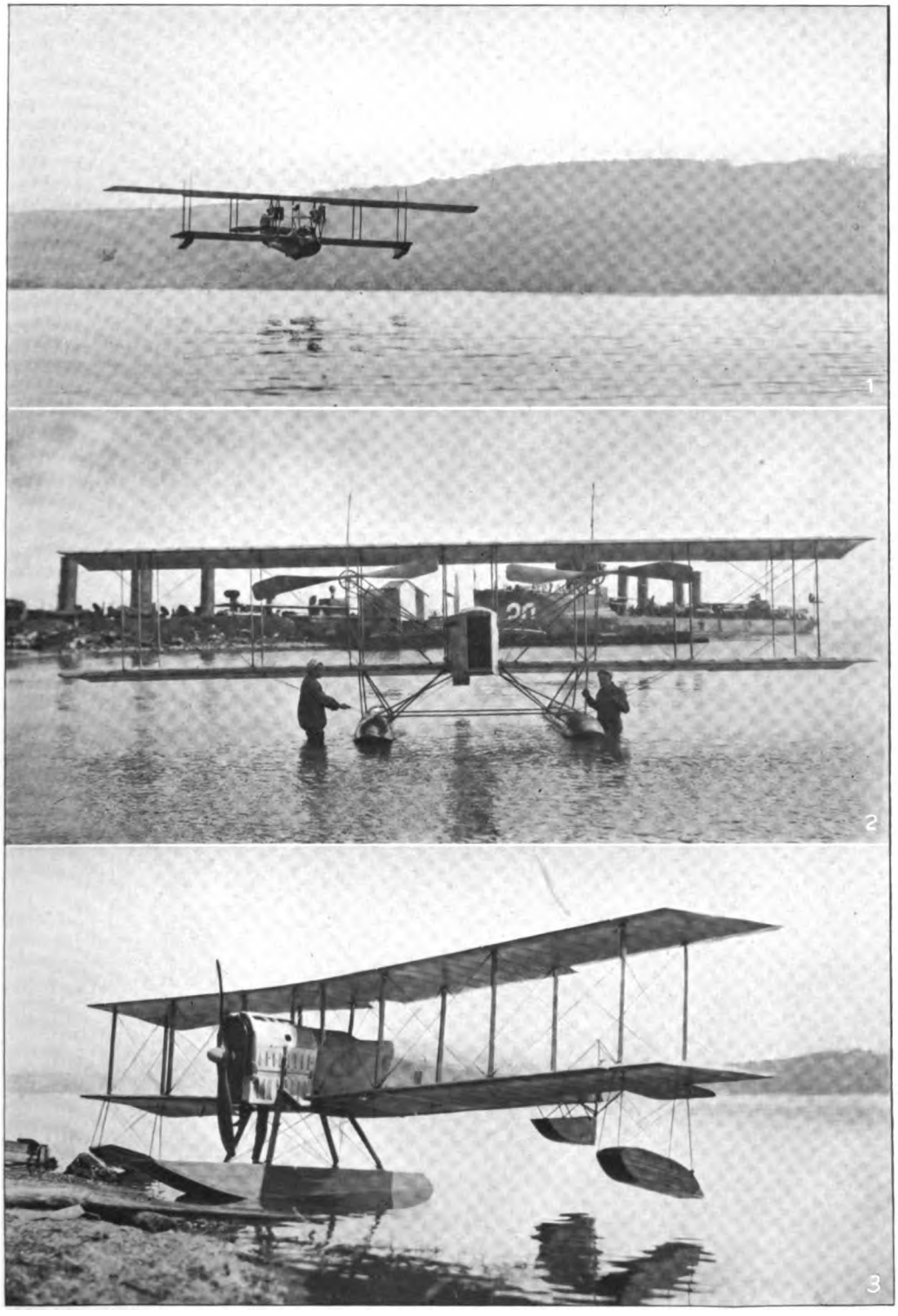
The solution of the problem of control naturally follows the successful accomplishment of aeroplane sustentation, and in the successful execution of the acts of balancing, banking, and steering, depends the success of the machine as a practical commercial craft. In the design and construction of air craft there are 10 essentials to be borne in mind: (1) An aeroplane must have sufficient combined speed and plane area to raise its intended load, together with its own weight. (2) The greater the speed the less the plane area, and the less the necessary angle of that plane for the same effect. (3) To counteract the resistance set up by means of gaining momentum while on the ground, which is additional to the resistance the machine will have when once clear: *a.* extra power is required, or *b.* extra plane surface to meet the power we have, *c.* a better effect for the power we have, *d.* an outside agency that will assist. Extra power means more weight, extra plane means more resistance, better effect for the power we have means improvement in the engine or means of propulsion, an outside agency means a fixed starting point. (4) The planes must always be sufficient to permit of a safe landing. (5) Their exact shape depends upon the type of machine constructed, the means employed for obtaining lateral and longitudinal balance and stability, and varies so greatly that no particular rule can be laid down. (6) The planes should be constructed of materials as strong as the end in view permits, and should in themselves create as little useless resistance as possible. (7) The general arrangement should be as simple as the design allows. (8) The control should be simple and easy of manipulation. (9) The balance should be automatic. (10) Although it is difficult to obtain, a means of keeping afloat until a safe landing is made without engine power perfects the aeroplane.

Before starting to build any machine, either full size or model, the following points require to be known by the constructor: First, the weight of the complete machine; second, the area of supporting surfaces necessary; third, the amount of power required; fourth, dimensions; fifth, size and speed of propeller, and lastly, methods of control. Weight forms the basis of designing. It may seem somewhat difficult to assume the weight of an object, before knowing its dimensions, but it is not difficult to build an object of such dimensions that it will not exceed a certain weight.

Equilibrium.— In flight, the weight of the aeroplane is supported by the reaction between the wings and the relative wind created by their motion through the air. So long as the proper relative motion continues, the wings perform their function of maintaining an upward pressure, but it depends on a variety of circumstances whether that pressure continues to be applied exactly in the correct way. At this point it will be necessary to explain two technical terms: the centre of gravity (C.G.), and the centre of pressure (C.P.). The centre of gravity is the point where the weight of the machine seems to be concentrated, and the centre of pressure is the point at which the lift of the wings seems to be focused. Any object that is supported exactly at its centre of gravity is always balanced in any position in which it may be set. When it is not supported, it tends to fall into such a position as will bring the point of support vertically in line with the centre of gravity. Like ships, aeroplanes are potentially liable to pitching, rolling and yawing, and it is essential from the beginning to recognize that some of these acts may at times be essential to the guidance of the machine from one point to another through space. If, for example, an aeroplane were incapable of being made to swerve at will, it could not be steered; on the other hand, a tendency to make erratic changes of direction of its own accord would be described as directional instability. It is important to bear in mind that the air does not provide a fixed platform. When an aeroplane is canted, so that one wing is lower than the other, the C.G. of the machine has not necessarily been disturbed. There is a very ingenious side-show, often to be found at large exhibitions, that may assist the imagination in grasping the breadth of the subject. It consists of a flexible track that ceaselessly undulates in supposed presentation of the waves of the sea. The raft-like trolley serves as a very good object-lesson in two forms of stability. The machines in question are stable in the ordinary sense to the degree of absolute security, for they cannot conceivably capsize. On the other hand the instability of their direction makes it almost impossible to guide them three or four yards without running into either side of the barrier. When an aeroplane is canted, the forces brought into play correspond with those that make the trolley run into the barrier, and their effect is equally to tend to make the aeroplane slip down sideways through the air. In the broader use of the term, what ordinarily is called longitudinal stability has to do with the prevention and cure of pitching; lateral stability — similarly related to rolling, and directional stability to yawing from the course.

Lateral Balance.— When an aeroplane is seen advancing from directly in front, the upward pressure or lift of its wings may always be assumed to be acting in a direction perpendicular to the spars. The downward force of the weight acts always vertically toward the earth. If, therefore, the wings are canted, their pressure is no longer precisely in line with the weight, and there is, necessarily, a sideways component tending to make the machine swerve off its former course. On the assumption that the machine ascends into the air with its wings level, it is necessary to account for the disturbance of the balance by

HYDROPLANES



1 Curtiss Transatlantic type flying boat
2 Naval hydroplane — twin-propeller, model k
3 Sport type flying craft

HYDROPLANES

MARINE FLYING CRAFT — SPORT TYPE

1 Thomas-Morse SH-4 Navy Hydro-airplane
2 Model H-4 " America " Type
3 Sport Type Flying Craft
4 Sport Type Flying Craft
5 Burgess Navy Tractor
6 Verville Type Flying Boat

the introduction of some extraneous force. This, however, is readily supplied by supposing that the machine is struck by a gust. A gust, for present purposes, is assumed to be a sudden veering or backing of the relative wind. It is not necessary that the machine should be possessed of vertical fin surfaces, against which the oblique wind may strike, in order to account for the tendency of a gust to cant an aeroplane. The characteristics of wing-forms as ordinarily employed suffice in themselves to explain the occurrence, for if a gust is a sudden veering of the wind, it is equivalent to a sudden spinning of the wings about their vertical axis, as a propeller might spin on a vertical shaft. Under such conditions there is an obvious tendency for one wing to lift more than the other, and so to upset the balance. Lateral balance in the modern machines is secured by various methods. First, warping, which means that the relation of the wing surfaces to the relative wind are changed by the pulling of wires for a temporary period to aid in the control of balance. Secondly, machines of the biplane type are constructed with their upper wing in advance, slightly, of the lower wing, which enables the pilot to manœuvre the machine very effectively in gusty weather. (Consult Berriman, 'Aviation'). Thirdly, dihedral formation of wings has been introduced with much success. That is, wings which rise from a point at which they meet (exactly above the body of the machine) to their outward surface.

Steering.— There is perhaps no object of a technical nature so universally familiar by name, appearance and purpose as the rudder. Everyone knows that the rudder is to steer the craft to which it is attached. The direct effect of a rudder relates to the control of movements about the vertical axis of the craft. Such movements may conveniently and appropriately be referred to under the general term "yaw." It is the tendency of the craft to yaw on its own vertical pivot that the rudder is used either to check or to initiate. When steering a straight course, the rudder is used to counteract disturbances that otherwise might give rise to yawing. In an aeroplane, which has no appreciable extent of vertical surface in the vicinity of the C.G., a slight yaw will of itself present equivalent to the side of a ship against which the air can react. But when an aeroplane with positive wing tips is caused to yaw, one tip is thereby accelerated while the other is retarded, and so a bank is established which in turn tilts the direction of the air pressure on the wing. It is this tilting of the air pressure by canting the wings that provides the steering force in the case of an aeroplane.

Types of Aeroplanes.— The different types of aeroplanes are distinguished according to their number of supporting plane surfaces. The "monoplane" with one plane surface; the "biplane" with two super-posed plane surfaces; the "triplane" with three supporting surfaces; and the "multiplane" with any number of supporting surfaces in advance of three.

Monoplane.— For a considerable period in the history of practical aeronautics the monoplane held the pre-eminent position, in that period when France was in the forefront, and when she developed a corps of sportsmen who were eminent throughout the world. This was due to the excessive speed which could be acquired with this type of machine. The assets of the monoplane are, briefly, lightness, speed, both in climbing and racing. Its disadvantages, inability to carry a load, the proficiency which it demands of the pilot, the extensive smooth landing grounds necessary.

Biplane.— The most common of modern machines, because of its adaptability to all conditions of aerial navigation. The types vary greatly (consult Fage, 'Aeroplane') from the machine with narrow advancing plane edge for speed, to the machine with a wing spread of 157 feet, equipped with multiple motors, for load carrying and long distance reconnaissance.

Triplane.—This type has been developed to extend further the load carrying capacity of the biplane. It will undoubtedly represent in the period immediately succeeding the war the vehicle that will be entered first upon the aerial carrying commercial ventures.

Hydroaeroplane.— A hydroaeroplane has been described as an air-borne craft capable of floating on water. Such a machine must be made sufficiently strong to resist the severe buffeting of a rough sea, although its flying capacity is affected by any undue weight and head resistance. Single and double floats are used. The floats should not be too far apart, otherwise the lifting of one float out of the water due to excessive rolling causes the machine to suddenly swing round; and, moreover, the unbalanced forces called into action by the reduction of the resistance of the rising float, and the increase of resistance of the falling float, are greatly assisted by the leverage between the two floats. On the other hand when the two floats are close together, the behavior approximates that of a single float machine. The water resistance of the floats appears to be practically independent of their distance apart. To prevent the float driving into the water when the machine alights, and also to keep the nose of the float well out of the water when the machine is at rest on the water, it is desirable that the centre of buoyancy of the float, when the longitudinal axis of the machine is horizontal, should be well forward of the position of the centre of gravity of the machine. The total buoyancy of the floats should be almost equal to twice the weight of the fully loaded machine. While the float is rising from the water the free access of air to the bottom of the step should not be hindered. The tendency to hop — a characteristic of most floats when running along the surface of the water at high speeds and small buoyancy — is due to the inherent instability of a machine partly supported on a small area. Any tendency to dip the nose of the float under water may be minimized by a low position of the line of propeller thrust.

Flying Boat.— The flying boat had its inception in America, where Glenn H. Curtiss was the first to design this type of craft. It is an ordinary aeroplane in wing structure, either biplane or triplane, but with a boat-shaped hull for landing on, and subsequently, if necessary, navigating the water. See AEROPLANE DISTANCE AND SPEED RECORDS; AEROPLANE ALTITUDE RECORDS; AERONAUTICAL NOMENCLATURE. Consult Woodhouse, 'Naval Aeronautics.'

G. DOUGLAS WARDROP,
Managing Editor Aerial Age.

AEROPLANE ALTITUDE RECORDS. As speed and duration of flight progressed according to the advances in engine and body design, so, too, the altitudes attained kept pace with the growth of engine power and of superior design in the planes. It was early realized that the greater the height attained the greater must be the power of the engine to raise the plane in the atmosphere which becomes ever rarer as the plane ascends. In 1909 the record altitude for the aeroplane stood at 1,473 feet; this was raised to 10,499 feet in the following year. In 1912 Garros ascended 19,032 feet at Tunis, Africa, but this record height was surpassed by Perreyon, who, on 14 March 1913, reached a height of 19,650 feet in a Blériot monoplane. In the closing days of the same year G. Legagneux made the record ascent of the year by attaining a height of 20,090 feet. On 27 June 1914 the Austrian, H. Bier, with one passenger, ascended 20,260 feet. In the same year Garaix took four passengers up to a height of 10,000 feet; six passengers, 5,730 feet; and nine passengers to a height of 5,220 feet. On 25 April 1914 the Russian pilot, Sykorsky, took 15 passengers to a height of 980 feet in a Sykorsky biplane fitted with a 400 horse-power Argus motor. In 1916 H. G. Hawker ascended at Brooklands, England, to a height of 24,408 feet.

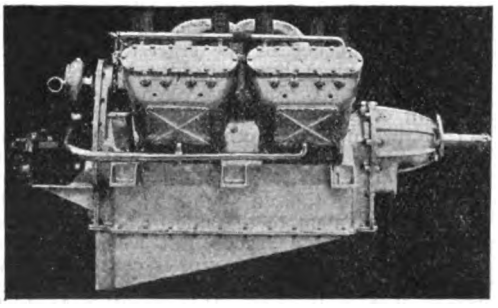
AEROPLANE DISTANCE AND SPEED RECORDS. The aeroplane developed increased speed in successive years as a result of improved construction and design and especially of improvements in engine-building. A speed of 61 miles per hour was the greatest reached up to 1910, when this speed was attained in a Blériot monoplane. This record was surpassed the following year when Weymann attained a speed of 78.7 miles per hour in a Nieuport monoplane. A speed of 100 miles per hour, the goal for years of designers and engineers, was reached and passed in 1912, when Vedrines, in a Deperdussin machine, made the record speed of 107.4 miles per hour over a distance of 124 miles. This record was not to remain long unsurpassed for in 1913 Maurice Prevost made new records for all distances from 10 to 200 kilometers (6.2 to 124 miles), when, at the Bennett cup competition at Rheims, he traversed the 200-kilometer course (124 miles) in 59 minutes 45 3/5 seconds, making an average speed of 126.5 miles per hour. This speed was made in a Deperdussin monoplane with a 160 horse-power Gnome motor.

In 1914 M. Garaix, in a Schmitt biplane, piloted four passengers a distance of 26.58 miles at the rate of 67.28 miles per hour; five passengers 12.5 miles at the rate of 67.28 miles, and six passengers a distance of 31 miles at the rate of 66.85 miles per hour.

In 1913 Deroye, in a Blériot monoplane, made a non-stop flight of 486.87 miles, and in April 1914 Garaix, with six passengers, covered a distance of 68.3 miles without alighting.

The European War completely paralyzed competitive aviation, aeroplanes being commandeered for military purposes and aviators pressed into army service, and there were no records accepted by the International Aviation Federation during 1915, 1916 or 1917. Several important flights were made, however, of which the following are the most noteworthy: On 20 June 1916 Lieut. A. Marechal of the French army made a non-stop flight of 812 miles, starting from Nancy, France, and alighting at Chlom, Poland. On 3 November of the same year Victor Carlstrom flew from Erie, Pa., to New York city (515 miles) in 4 hours 11 minutes, and on the 19th of the same month Miss Ruth Law set out from Chicago on a flight to New York, reaching Hornell, N. Y., 590 miles from Chicago, in 5 hours 45 minutes; on the following day she completed the remaining 294 miles of the journey in 3 hours 10 minutes and 35 seconds. On 11 Dec. 1917 Miss Katharine Stinson established a new record by flying from San Diego to San Francisco, a distance of 610 miles, in 9 hours and 10 minutes, the longest non-stop flight hitherto made in America.

AEROPLANE ENGINES. There are three prime requisites for a good aeroplane engine — reliability, small weight per horse-power and low fuel and oil consumption. Since these requirements are more or less conflicting, a compromise is necessary and the designer is confronted by the delicate question: Which of these is the most important? German designers, with their customary thoroughness, have produced more reliable, but, generally speaking, heavier engines than those of England and France. For military work this has proved a weak point, because the lighter, and hence faster, aeroplanes can easily secure positions of advantage over their enemies, which usually makes it possible to bring them down. For non-military service, however, except racing, reliability is unquestionably the fundamental requirement. The balance between weight and

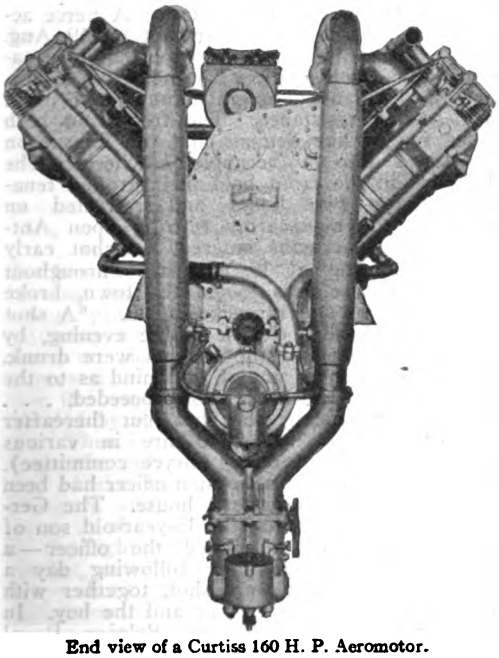


Thomas Aeromotor, Model 8, equipped with a self-starter.

fuel economy will be fixed by the particular service required, for the matter of importance is not the engine weight only, but the total weight of the engine and fuel. This is easily appreciated when one realizes that the fuel required for a flight of six or seven hours weighs as much as the engine itself. For short flights during which but little fuel is used, an exceptionally light engine is desirable, for the poor economy usually characteristic of such an engine is not very important. However as the length of flight increases, economy becomes more and more important. Other requisites which must not be overlooked, though they are by no means as important as those just mentioned, are compactness, accessibility, freedom from vibration, flexibility,

silence and reasonable cost. Little need be said in regard to these as they are almost self-evident to any engineer.

The reliability of an engine is the final proof of the skill of its designer in mastering every little detail. This is particularly true of an aeroplane engine because its service is so much more severe than that of an automobile engine that any weakness will show itself much sooner. Since weight is of such great importance, every member of an engine will probably be designed so as to be stressed to the maximum safe limit. For this reason any cast metal should be avoided as far as possible because of its uncertain strength. In nine engines a certain cast member will be strong enough, yet in the tenth some imperfection in the casting may cause a failure at a critical moment. Forged or rolled steel is one of the most dependable materials known to-day and as it is also the lightest for a given strength, it is ideal for aeroplane engines. Consequently



End view of a Curtiss 160 H. P. Aeromotor.

it is standard practice in a large percentage of the successful aeroplane power plants to-day. Since the greatest strength of steel is utilized when the stress acting upon it is one of tension it is advisable to design the engine so that parts which sustain the greatest strains shall meet with purely tensional stresses as far as possible. Lubrication is another factor on which the reliability of an engine is dependent and is receiving more and more attention from designers. It is probably the one point on which the success or failure of a heavily-worked engine hinges more than anything else. One of the improvements in lubricating systems which is gaining favor at present is that of cooling the oil after it has been used once and before using it a second time. The reason for this is that oil apparently deteriorates upon prolonged exposure to heat, causing a falling off of the power of an engine because of inferior lubrication. An aeroplane engine must, of course, be as economical as possible of both fuel and oil. Fuel economy implies a high compression, since efficiency rises with the compression ratio; and careful workmanship is an essential, so as to eliminate any unnecessary friction.

For any particular type of engine there are three places to look for a possibility of improved efficiency — the carburetor, gas passages and ignition system. These are facts well known to automobile engineers and have been the cause of much research. For very high engine speeds it has been proved that the number and location of the spark plugs has an appreciable effect upon efficiency. When two-point ignition is used, failure of one of the plugs must be guarded against because it will not cause missing and therefore may not be detected. Since two-point ignition requires a smaller angle of advance than the single point, the failure of one plug will cause late ignition in its cylinder with its resultant heating and lowered efficiency.

At present the magneto reigns supreme for the ignition of aeroplane engines, but it may be replaced by some battery systems because of the increasing necessity for an electric generator for wireless outfits, searchlights, stabilizers, etc.

It almost goes without saying that any unnecessary weight on an aeroplane engine must be eliminated and the greater use of aluminum and the higher grades of steel will play an important part in having decreased weight go hand in hand with all round efficiency.

G. Douglas Wardrop,
Managing Editor Aerial Age.

AEROSTATICS, a branch of science treating of the equilibrium and pressure of air and other gases, and of the methods of measuring it by the barometer and other instruments. The expansive force or pressure of atmospheric air varies with time and place. In a medium condition of the atmosphere, and near the sea-level, barometrical observations give the pressure or weight equal to that of a column of mercury 30 inches high, or of a column of water about 34 feet high. This makes the mean pressure of the atmosphere nearly 15 pounds on every square inch. Aërostatics also investigate the phenomenon of the high compression of gases; in other words, the relations between the elasticity and the density or volume of a gas. According to the law of Mariotte, the expansive force of one and the same body of gas is proportional to its density; or, which is the same thing, the expansive force of a body of gas under different degrees of compression varies inversely as the space which it occupies. See Gas; Pneumatics; Thermodynamics.

AEROTHERAPEUTICS. This literally means the treatment of disease by air and is usually limited to the supposed value of air in certain chest diseases, notably of tuberculosis, and the use of compressed air for special chest conditions.

This is a difficult subject to treat since there is so much popular tradition and medical superstition regarding the value of air in the treatment of chest conditions. The general attitude that regards open-air treatment

of tuberculosis as of prime importance stands in marked contrast to the position taken by the few that the air *per se* has little or nothing to do with the matter. In fact the open-air treatment of tuberculosis is a vastly much more organized program than its name would imply. Under the general idea of «open-air» is included exercise, freedom from work, extra feeding, psychotherapy, humidity, skin stimulation, etc., etc. The air itself in reality plays an insignificant part in the therapy. The reason for this is plain. It is well known that the sole stimulus in air is the oxygen contained within it. It is also an axiom of physics that the composition of the air so far as its gases are concerned is constant the world over at the sea-level and under average conditions. There is no more oxygen in one air than another and no less unless in a hermetically sealed space specially treated by physical procedures. Hence oxygen transfer in the lung is constant under the same barometric pressures and temperatures. Rarified air in high places contains differing proportions of oxygen but here the problem is not so much one of the oxygen as of the barometric pressure and the relationships of the tension of oxygen in the tissues and the external atmosphere and carbon dioxide tensions in the tissues. Special problems arise here which are in need of special forms of consideration, which cannot be discussed here. Here oxygen want develops a special type of illness — «mountain sickness.»

Water and air (oxygen) are among the most constant things in the environment. They rarely ever change in their gross composition, hence they have built up invariable interactions between the body and the environment. The real work of supplying the proper amount of oxygen takes place within the lung tissues and is not dependent upon the external oxygen supply which is always ample and constant under the ordinary conditions of life.

Hence it can be seen that although the physiology of respiration is extremely complex, there is, properly speaking, no real problem of air treatment in the ordinary sense, and the «open-air» treatment of tuberculosis is a misnomer. The largest factor is an elaborate psychotherapy. The oxygen itself plays the least rôle in the therapy. Popular misconceptions regarding air in buildings, in theatres, in subways, etc., etc., are abundant. When the laity speaks of «bad air,» it really means foul-smelling, humidity, heat and other things. The air, so far as its oxygen and the respiratory needs are concerned, is not «bad.» It is constant all over the world — in the garret or in the cellar, rooms with windows open or windows shut — the oxygen never varies. The æsthetic wishes of individuals vary and make them prefer sleeping porches or inside rooms and thus the psyche is affected. The actual respiratory needs are equal everywhere under similar atmospheric pressures and similar temperatures. Consult Bayliss, 'General Physiology'; Henderson, 'Fitness of the Environment.'

SMITH ELY JELLIFFE.

AEROTROPISM, the sensitiveness of certain plant organs which enables them to orient themselves from certain gases dissolved in the medium in which they are grown. Various roots also possess this property. See CHEMOTROPISM.

AERSCHOT, a town of Belgium, 26 miles southeast of Antwerp and 20 miles northeast of Brussels. Situated on the river Demer, it is a junction of railroad and steam-tramway lines running to Louvain (q.v.), Herenthals, Tirlemont and Haecht. Its modern importance was derived from its cloth manufacture and railway works. The town contains an old Gothic church with fine choir-stalls of the 15th century and an altar piece by the Flemish painter, Gaspar de Craeyer (1582–1669). At the beginning of August 1914 Aerschot boasted a prosperous population of about 8,000 souls; these were doomed to a tragic fate in the early stage of the European War. With the possible exception of Termonde, Aerschot seems to have suffered more than any other place in the Flemish-speaking part of the country. A fierce action was fought round Aerschot on 19 Aug. 1914. German infantry, supported by machine-guns and artillery, opened the attack, and the Belgians, although outnumbered, made a desperate resistance. The troops on both sides fought like demons and the fight soon developed into a veritable butchery. The Belgians in the front held their ground tenaciously for two hours and retreated on Louvain, the main army retiring upon Antwerp. The Germans entered Aerschot early in the morning of 19 August. Throughout the day the soldiers looted the town, broke store windows and ransacked them. «A shot was fired about 7 o'clock in the evening, by which time many of the soldiers were drunk. The Germans were not of one mind as to the direction from which the shot proceeded. . . . No one was hit by the shot, but thereafter German soldiers began to fire in various directions at the people» (Bryce committee). It was also said that a German officer had been killed at the burgomaster's house. The German version stated that the 15-year-old son of the burgomaster had killed the officer — a Colonel Stenger. On the following day a number of civilians were shot, together with the burgomaster, his brother and the boy. In the report presented by the Belgian Royal Commission to President Wilson at Washington it was stated that «the Germans took every man who was inside of Aerschot; they led them, 50 at a time, some distance from the town, grouped them in lines of four men, and, making them run ahead of them, shot them and killed them afterward with their bayonets. More than 40 men were found thus massacred.» About 150 inhabitants of Aerschot were supposed to have been killed. For three days the invaders pillaged the houses and set fire to them. Much of the portable property was sent into Germany (13th Belgian report). «I know there were 91 shot at Aerschot and that there, under pain of death, their fellow citizens were compelled to dig their graves» (Cardinal Mercier). Immediately after the battle of Malines (q.v.), which resulted in the evacuation by the Germans of the district of Malines, Sempst, Hofstade and Eppeghem (25 Aug. 1914), a long series of excesses were committed either

just before or during the retreat. At Aerschot and the other villages from which the Germans had not been driven, the effect of the battle was to cause a recrudescence of outrage and pillage. Large numbers of civilians, men, women and children, were herded into the church. The priest of Gelrode, a village near Aerschot, was brought here, made to stand for some hours with his hands above his head, and finally shot by five soldiers. Some of the prisoners were actually kept in the church until the arrival of the Belgian army on 11 September, when they were released. Others were marched to Louvain, and with others from the surrounding districts were taken to Germany.

In May 1915 the German government published a White Book under the title of "Offenses against International Law in the Conduct of the War by the Belgians." It contained the results of an official inquiry into the Belgian allegations, and gave the evidence of numerous witnesses — German officers. In the section relating to Aerschot Captain Karge relates that he observed regular volleys from 8 or 10 rifles from a particular house; that he broke into it and set fire to it. No civilians are suggested to have been found by any of the soldiers who went upstairs to assist in the destruction; the house appears to have been empty. The captain stated: "Thereupon, I pushed into the house with the others, and using a fairly large quantity of turpentine . . . succeeded in a very short time in setting the house on fire. . . . When I left the burning house, several civilians, including a young priest had been arrested from the adjoining houses. . . . I then put the columns on the march out of the town, took command of all prisoners, among whom I set free the women, boys and girls. I was commanded by a staff officer to shoot the prisoners. Then I made some of my gendarmes arrange the columns and keep them in motion out of the town, while others escorted the prisoners and took them out of the town. Here, at the exit, a house was burning, and by the light of it I had the culprits — 88 in number, after I had separated out three cripples — shot." No mention is made of any investigation or trial. See ANDENNE; LOUVAIN.

ÆSCHINES, es'ki-nēz, the greatest of Greek orators except his rival Demosthenes: b. Attica, 389 B.C.; d. Samos, 314 B.C. That he rose to immense influence and high station by his unaided genius, despite family poverty, would be considered his best title to honor in democratized modern states; it was charged against him as a foul disgrace in Athens. The further "campaign" accusations of Demosthenes — that his father was a schoolmaster's freedman and his mother a public dancer and courtesan, and that he changed the family name to a more genteel form — are valuable only as examples of what passed then for fatal obstacles to public trust and private honor, and the last-named reads curiously in a modern atmosphere. That his father was a poor schoolmaster, and that he worked in the school to help, is probable; more than probable also are his boasts of good blood despite it, as several of the brothers became leading citizens, one of them being on the board of 10 *strategoi* which conducted military and foreign affairs. He may have been, as alleged, a professional gymnast; unpaid athletics were too reverently worshipped there to make paid ones seem unnatural. He certainly served a long term of military duty (probably not all at once), and with distinction; for he was in the battles of Mantinea (362) and Tamynæ (349), and for bravery in the latter was deputed to carry home the news and accorded a crown. Meantime he had become a magistrate's clerk; a petty actor; finally secretary to the important political leaders Aristophon and Eubulus, who helped him twice to an election as government secretary. He was now 40 and had not "found himself"; but with the chance of addressing the public his true talent soon became manifest. He quickly acquired an eminent mastery of legal and political knowledge, and became a singularly graceful and effective speaker, with remarkable finish, harmony and variety of oratorical effect. In 348 he was sent to the Peloponnesus to organize a union of the Greeks against Philip of Macedon, but failed entirely, and doubtless became convinced at that time that any such scheme was permanently impracticable. The next year he went as one of the embassy to negotiate peace with Philip, and on their report (which Grote pronounces "a tissue of impudent and monstrous falsehoods," not necessarily of their own invention, but acceptance of Philip's word), the Peace of Philocrates (another envoy) was concluded in 346. Philip grew more and more powerful, and Demosthenes more and more urgent for opposition to his plans, which, however plausible — a Græco-Macedonian union against the barbarians and the East — could in practice only be carried out, as they at last were, by absorbing Greece in Macedonia. Æschines as steadily supported the Macedonian alliance, and doubtless as honestly, from conviction that for disunited Greece the only choice was between league and conquest — which also was true. In 345 Demosthenes charged him with treason and bribery. He was acquitted without difficulty. Three years later the charge was renewed in Demosthenes' great speech "On the False Embassy"; Æschines rebutted it with success in his speech of the same title. He helped on the Macedonian cause all through the reign of Philip and the early part of Alexander's, accused by the opposing party of being a hired emissary of Macedonia, and returning as much and presumably as just abuse as he received. That the public made the necessary discount is proved by the fact that he lost no credit with them. At last he assumed the aggressive with disastrous results. One Ctesiphon having proposed a golden crown for Demosthenes in recognition of his services to the commonwealth, Æschines impeached him for proposing an illegal act, and made his greatest speech, "Against Ctesiphon," an indictment of Demosthenes' entire public life. Demosthenes replied with *his* greatest, "On the Crown"; so crushing that though the pro-Macedonian party was in the ascendant Æschines could not obtain the one-fifth minority of votes legally necessary to save him from *atimia,* or infamy, and a fine of 1,000 drachmas. He left Athens at once without paying it, and thereafter taught rhetoric or schools of oratory in foreign parts; some say Ionia and Caria, and finally Rhodes after Alexander's death. He died at Samos,

aged 75. Three of his orations are extant — against Timarchus' charge of bribery after his second embassy to Philip, one on that embassy and the one against Ctesiphon. There is a story that he read the latter to his pupils at Rhodes, and on their professing to be astonished that despite its brilliancy he should have been defeated, replied, "You would not be if you had heard Demosthenes." A variant is that he read Demosthenes' speech as a model of rhetoric, and on their expressing admiration, replied, "If you had heard him roll it out himself!" The originals are in countless editions. Consult for text and best comment Jebb's "Attic Orators" (London 1876–80). Translations are also plentiful.

ÆSCHINES, Greek philosopher of the 5th century B.C., and a friend of Socrates. Of humble parentage and at first unfortunate in business, he achieved success as a teacher of philosophy in Athens, and as an orator and stylist of high rank. He was the author of several 'Orations,' 'Epistles' and of three Socratic dialogues: 'Virtue, whether it can be taught'; 'Riches, whether they are good'; 'Death, whether it is to be feared.' Consult Gomperz, T., 'Greek Thinkers' (translated by G. C. Berry, Vol. III, p. 342, London 1903).

ÆSCHYLUS, the founder of tragedy: b. Eleusis, Attica, 525 B.C.; d. 456 B.C. His father, Euphorion, was a nobleman. One of his brothers distinguished himself in the Persian war. At 25 the poet brought out his first play. Fifteen years later he won his first prize. But Æschylus was not only a poet; he was also a soldier, for he fought at Marathon (490 B.C.) and at Salamis (480). No patriot felt more keenly than he the impulse of that mighty national movement of Greece against Persia. In a contest with Simonides he failed to win the prize for an elegy to be inscribed over the fallen heroes. About 476 he went to Syracuse, where Hiero had gathered about him the most famous poets. Shortly before the death of Hiero he contended with Sophocles for the tragic prize and lost. It is likely that he thought his failure was due to politics or to partisanship. Later he was successful; but there was still a gulf between him and a large part of the Athenian public. His last and greatest work, the 'Oresteia,' received the first prize. Though acquitted of the charge of having revealed the Eleusinian mysteries, he withdrew from Athens. He died at Gela, Sicily, in 456. The Athenians erected a statue in his honor. In the epitaph, written by himself, he speaks only of his valor in the Persian war.

Theoretically Sophocles was the greatest Greek dramatist, but Æschylus was a genius of a higher type; the magnificence of his imagery and the sublimity of his conceptions are unsurpassed, if equalled, by any poet. He was also a genius of great resource and an artist of consummate conscience. Theologian, as well as artist, Æschylus sought to interpret the old myths, to find in them a doctrine on human destiny. He was the first poet to identify tragic action with a moral and religious question. There had been much skepticism in Greece; but the Persian war had brought a reaction, reviving the national religion. The poet's Zeus is the supreme ruler of the universe. But Fate is above Zeus. Necessity governs all. Every violation of the law of righteousness is followed by punishment. The sinner thrives for a season, but the penalty is at last exacted. Even Zeus cannot avert what the Fates have ordained. The Ruler governs by and through Justice. This idea dominates all the tragedies of Æschylus. To the Erinyes (Furies) is entrusted the moral government of the world; they execute the eternal immutable law, punishing every atrocious crime. Æschylus says nothing about the joys of the just in the next world, but he has a clear idea of retribution. Æschylus was thoroughly familiar with the stage; he superintended the performance himself; and he was excessively busy in improving the appliances of the theatre. But in his plays there are no carefully laid plots, no intricate weaving of incidents, no fine meshes of intrigue. His dramas, like his characters, are drawn only in large outline, with simplicity and manly straightforwardness. Lyric movement, epic interest and gnomic wisdom are first combined in Æschylus. His choral songs rise to the loftiest height. But in the episodes there are no surprises, no complications, no sudden reversals of situation. There is one idea and a uniform development. Whole personages are presented to the view of the audience. There is no unfolding of character. The poet sometimes touches upon the tenderness and delicacy of the gentler sex, but he does not dwell on these traits and study them in detail. His heroes move in an ideal sphere; they are ethical types, majestic, terrible. The tragedies of Æschylus were written in trilogies — groups of three plays with a single main theme. A grotesque satyr drama followed each trilogy. The number of characters never transcends seven. Two actors played the rôles for his earlier tragedies. Sophocles introduced a third actor. The Æschylean characters leave a lasting impression on the mind; they are not effeminate creatures, but "sturdy men that breathe of the spear and the lance and white-crested helmets, of casques and greaves and courage, doughty as the tough-hided seven-fold shield of Ajax" (Aristophanes, 'Frogs' 1014). The style of Æschylus is lofty, weighty in matter and original in expression. He has not the flashing wit and the ingenuity of Euripides, nor the poise of Sophocles, but he possesses a grandeur and broad simplicity surpassed by no other writer. In a wonderful manner he combines energy and intensity with lucidity, elevation and rapidity. His vocabulary is bold and full of hard words; his epithets strange and sonorous; his figures superb; in their Dionysiac elevation they approach the lyric flight of the Oriental. Both in diction and in sentiment the Greek poet bears a striking resemblance to Isaiah, or Job ('Agamemnon' 177, Job xxxiii, 15). In the splendor of his figures and in his powerful metaphors we see "visions vast as those of Ezekiel, yet conveyed withal in rich and radiant Greek." The mighty line of Æschylus gave unrivaled dignity to the narrative. When profuse, he is exceedingly difficult. His obscurity is due chiefly to luxuriant metaphors and to a pleonasm of imagery. The ancient rhetoricians called his style lofty, stately, dignified, archaic, magnificent. When the poet is simple he combines majesty and power with beauty in a style that surpasses the polished perfection of Sophocles and the

brisk dialogue and facile narrative of Euripides. Small wonder that Ben Jonson exclaimed:

"Call forth thundering Eschylus,"

or that Browning speaks of

"The thunder phrase of the Athenian grown
Up out of the memories of Marathon."

Æschylus was an exemplar of the austere style. Dionysius of Halicarnassus classes him with Pindar and Thucydides. Dio Chrysostomus praises him for his high-toned spirit, for his archaic coloring and for his boldness of thought and expression. There is no base cunning, no garrulity, no littleness in Æschylus. Though redundant at times, he surpasses all Greek poets in a certain Shakespearean concentration of phrase. The great number of reminiscences from Homer and the plasticity of his descriptions show how much he was influenced by the epic style. "The scraps from Homer's banquet," as he characterized his tragedies, included form as well as substance. Of all the tragic poets he is the one most steeped in Homer. His rhythms are finished and full of power and expression. Of the 70 tragedies attributed to him by his biographer only seven have come down to us. The 'Persians' was produced seven years after the battle of Salamis (472), the 'Prometheus Bound' in 470, the 'Seven Against Thebes' in 468, and the 'Oresteia' (consisting of the 'Agamemnon,' 'Choëphori,' and 'Eumenides' in 458. The date of the 'Suppliants' is uncertain. Many scholars consider it one of his latest works. I am inclined to place it about 489. See ORESTEIA, THE; PROMETHEUS BOUND.

J. E. HARRY.

ÆSCHYNITE, es'ki-nīt, the mineral for which Dana's Æschynite group was named. It is essentially a niobate, titanate and thorate of the cerium metals, containing also iron and calcium in small amounts. It occurs in black, prismatic, vertically striated crystals belonging to the orthohombic system. Its hardness is about 5.5, and its specific gravity about 5. It is rare, and occurs in the Ural Mountains, in Norway and in Silesia. It was named by Berzelius from a Greek word meaning "shame," in allusion to the "shameful" inability of chemistry, at the time of its discovery, to separate titanic acid and zirconia (two of its constituents).

ÆSCULA'PIUS (Greek *Asclepios*), the god of medicine among the ancient Greeks and Romans. In Homer he is merely a man, the god of medicine being Pæëon; the deification was probably founded on the Homeric story, and at any rate was subsequent. The notion that he was originally a god of light or the underworld, "reduced" to the tradition of a human being, inverts all historic processes and the nature of early thought. In Homer he has two sons, Machaon and Podalirius, famous as heroes and physicians; they are called Asclepiadæ, a name retained by their descendants or at least a priestly physician-caste. His daughters, Hygeia (health), Panacea (all-healer), Iaso (healer), etc., are later inventions, abstractions of relevant ideas. The later myths vary; some call him son of Apollo and Arsinoe, some of Apollo and Coronis, daughter of Phlegyas. In Hesiod the nymph was faithless, and with her bridegroom Ischys (one of the Lapithæ) was slain by the gods (the raven who brought the news being changed from black to white as a punishment); but Apollo rescued his unborn son from the mother's body on the funeral pile, and put him under charge of Chiron, where he grew to excel his master, able not only to prevent death but to raise the dead. At Pluto's complaint Zeus slew him with a thunderbolt, and after his death he received divine honors. The supposition that his worship originated in the Peneus Valley in Thessaly is perhaps due to the Homeric tradition being our earliest record; but if he was originally a healer wonderful to rude barbarians, it is likely enough that the tradition was Thessalian. Anyway, Tricca there was an old focus of his cult; but it flourished also to the south, perhaps carried there by the Thessalians forced southward by invaders. It had noted seats in Phocis, Bœotia, and especially in the Peloponnesus, where Thelpusa in Arcadia was one familiar seat; but by far the greatest was Epidaurus, south of Corinth. Here was a temple in a grove, where the sick had to spend a night, and the proper remedies were revealed to the priests in a dream, and the cured made sacrifice to Æsculapius, commonly a cock. The sleep was of course a mere part of the priests' mystification; but from their accumulated experience and their register of cases they must have become really expert physicians for the times. From thence the worship spread all over Greece and the islands and to Rome — nearly 200 temples in all; there were celebrated ones at Cos, Cnidus and Pergamus; the cult was introduced into Athens as late as 420 B.C., and to Rome 293 B.C., in consequence of a plague. Consult Walton, 'The Cult of Asklepios' (New York 1894); Wilamowitz-Möllendorff, 'Isyllus von Epidauros' (Berlin 1886).

ÆSCULIN, es'cu-lin, a bitter principle found in the bark of the horse-chestnut tree (*Æsculus hippocastanum*), especially in the spring, before the buds open. It crystallizes in small prisms having the formula $C_{15}H_{16}O_9.2H_2O$. Æsculin melts at 400° F. It dissolves sparingly in cold water, but easily in boiling water, the solution coagulating upon cooling. It is soluble in glacial acetic acid and in 24 parts of boiling alcohol. Æsculin is of special interest to the physicist on account of the notable bluish fluorescence (q.v.) exhibited by its solution in water. The word is also spelled æsculine, esculin and esculine.

ÆSOP, the fabulist. As early as the mid-5th century B.C. at least, fables were circulating in Athens attributed to a certain Æsopus, and held in such esteem that the city erected to him a statue by the great sculptor Lysippus; Aristophanes makes one of his characters learn the fables, Socrates versified such as he could remember and Plato speaks of them with approval; Herodotus, born c. 484 B.C., specifically tells us, as referring to a story too familiar to repeat, that when the Delphians offered compensation for his murder to the rightful claimant, it was claimed and received by one Iadmon, grandson of another Iadmon, a Samian and owner of Rhodopis the courtesan, who lived under Amasis, King of Egypt (c. 570-526 B.C.), and was redeemed by Charaxus, the brother of Sappho. That all this mass of detail concerning persons living less than a century before his

time, with easily verifiable dates, and about one whose fate was notorious, was in fact told of a myth and abstraction, and that there never was an Æsop, is exaggerating skepticism into absurdity; and the later accretion of fables and confusion of persons is irrelevant. Plutarch (late 1st century A.D.) fills out the story from lost authors, possibly with authentic traditions, perhaps mixed with real myth-making: that he was captured young and brought a slave to Athens, and after several changes of ownership enfranchised by Iadmon (which is inconsistent with Herodotus); that during Pisistratus' usurpation he visited Athens and composed the fable of "King Log and King Stork" for the edification of the citizens; that, going to the Lydian court, he became Crœsus' favorite, was sent by him as envoy to Delphi to distribute money to the people (about 564 B.C.), and, refusing to do so on account of a quarrel among them, was thrown from a cliff by them. This at least coheres with Herodotus. The stories of his being an ugly blackamoor, and others beyond the above, are derived from a worthless life of him published (but not written) by Maximus Planudes (q.v.), a 14th-century monk, in which he is apparently confounded with the mythical Oriental sage Lokman. As to the fables, it is probable that Æsop did not write them down, but merely told them to audiences; and it is perfectly certain that the ones we have under his name are not his (though they may incorporate the same incidents), but substantially a collection made from oral memories by Demetrius Phalereus of Athens about 320 B.C.; turned into Latin by Phædrus of the 1st century A.D., with additions of his own much inferior in every way; versified by Babrius, a Greek poet of perhaps the late 1st century; and variously translated and re-edited since. The usual popular "Æsop" is Phædrus. The origin of the fables is largely Oriental; but they are much superior to any Oriental prototypes in pith and conciseness. It is often said also that they are part of the stock of beast-apologues common to the entire Indo-European races; but this is true only in the sense that animals have been made to talk in all old folk-lore. The special qualities of "Æsop" — the immense compression of idea almost to "indecent exposure," in Sydney Smith's phrase, the sweep of generalization, the acute analysis of typical human characteristics — make it unique; and it quite probably inherits these traits from the genius of the real Æsop, a Greek of the mighty age of Greece. See FABLES OF ÆSOP, and consult Jacobs' 'Introduction to the Fables of Æsop' (New York 1896); Keidel, 'The Editio Princeps of the Greek Æsop' (in *American Journal of Philology*, XXIV, 304–317, 1903).

ÆSOPUS, Greek historian, author of the history of Alexander the Great, translated into Latin by Julius Valerius, discovered in 1816.

ÆSOPUS, Clodius, Roman actor of the 1st century B.C., a contemporary of Roscius. When acting he entered into his part to such a degree as sometimes to be seized with a perfect ecstasy. Plutarch mentions a report concerning him while representing Atreus, that, deliberating how he should revenge himself on Thyestes, he was so transported beyond himself that he smote one of the servants who was crossing the stage and killed him on the spot. He was a dramatic tutor of Cicero, and befriended him in exile. His last appearance was at the dedication of Pompey's Theatre in 55 B.C.; his voice thereafter failed. His folly in spending money on expensive dishes made him as conspicuous as his dramatic talents. He is said, at one entertainment, to have had a dish filled with singing and speaking birds, which cost $4,000. His son Æsop inherited his father's worst traits; it was he who drank the $40,000 pearl dissolved in vinegar, to be noted as having drunk the most expensive known beverage.

ÆSTHETICS (from Greek *αἰσθάνεσθαι*, "to perceive"), is the science of beauty and art.* It can be treated from the *scientific* standpoint, in which the actual qualities of the different varieties of beauty and art are investigated empirically, or from the *historical* standpoint, by the exposition of the views which have been held as to the nature of art and beauty in their chronological sequence and under their authorship, or from the *systematic* standpoint, by the independent investigation of the philosophical question of the nature of art and beauty. The scientific standpoint is too technical and too intricate to be susceptible of treatment within the narrow confines of an encyclopedia article, so that we shall approach the question entirely from the other two avenues.

Æsthetics receives its first scientific treatment in the work of Plato (q.v., 428–348 B.C.). In accordance with the views of his master Socrates (q.v.), Plato identifies the good, the beautiful and the true. All these are regarded as being ultimately one ideal entity, the Idea of the Good. This is incarnated with increasing perfection in corporeal beauty, in the beauty of noble souls, in the virtues, and in the sciences, until at last we meet it unalloyed and pure. The beautiful as we find it in concrete beautiful objects is for Plato an imperfect exemplification, that is a copy, of the Idea of the Good. As it is the nature of art to copy and imitate, a work of art is still further removed from the Idea of the Good than the object of which it is a copy, and hence possesses less beauty. Accordingly the greatest care is necessary to prevent art from being a hindrance rather than a help in the search for beauty, and in the ideal state it will be under strict supervision in order that the deterioration consequent on its remoteness from the Idea of the Good may not turn it into a source of positive evil.

In so far as he exhibits a certain parallelism between the beautiful and the good, Plato, and indeed all the other Greek philosophers with him, is unquestionably right. Beauty and Virtue are both normative concepts — that is, they both establish a chain of values running from the lowest to the highest. Furthermore, both the beautiful and the good seem to have a claim on our action: we refrain from at least as many deeds because they are in bad taste as because they are evil. Still, there are so many cases where the two standards appear to conflict that their absolute identity is doubtful. It is a familiar experience to find an artist a hopeless reprobate, or a thoroughly good man an utter Philistine. This would be quite impos-

*The word is also used by Kant in its etymological sense, as the science of sense-perception.

sible if goodness and beauty were completely identical.

In Aristotle (q.v., 384–322 B.C.) we find the first germ of a distinction between ethics and æsthetics, for he says that whereas beauty may be found in the unchanging, only actions are good. It will readily be seen that this is not a very sharp distinction, and Aristotle does not go on to develop its implications. In the spirit of his master Plato, he gives as the essential marks of beauty order, symmetry, and limitation. He makes the important statement, which has served as a basis of the theories of many later æstheticians, that the pleasure induced by beauty is disinterested.

Aristotle's theory of beauty, in so far as we possess it, is extremely undeveloped, and accordingly we find no use made of it in his book on art, the 'Poetics.' Here he follows Plato in considering the essence of art to be imitation. The motive of this imitation is the universal desire for knowledge, so that the value of the knowledge imparted determines that of the work of art. Therefore a work of art performs its function properly when it gives us the most valuable knowledge of things — the knowledge of their inner essence. This requires idealization and generalization, so that the true art portrays types, not individuals — laws, not facts. Thus while for Plato art is essentially inferior to nature, for Aristotle it may and should be superior to nature.

Aristotle assigns to music — and implicitly also to the other arts — four functions. These are (1) that of serving as an amusement; (2) that of moral education; (3) that of constituting an enjoyable exercise; (4) that of "purification." The first and the third of these four values are obviously only the passive and the active phases of a single one. As for the emphasis which Aristotle puts on the moral purpose in art, it is to be remembered that beauty and morality are for him essentially one and the same thing, so that this moral purpose undoubtedly stands not only for what we should ordinarily know by that name, but also for the intrinsic beauty of the work. The "purification" which art is supposed to produce is an emotional one. If we accept Zeller's interpretation of this point, Aristotle means that music and the tragedy furnish a safe outlet for our more violent emotions by turning them from the individual and particular to the general and universal, owing precisely to that typical reference which we have seen to be characteristic of art in the Aristotelian system.

The next great figure in æsthetics is the Neo-Platonist Plotinus (q.v., 204–269 A.D.). Like all the Greek philosophers, in fact, he too maintains that the beautiful is intimately related to the good, but this relationship receives less emphasis in his system than in those of Plato and Aristotle. Plotinus is a mystic, and he considers that all things are emanations from the One, which he also knows as the Good. In so far as these emanations are perceptible to our external senses, we experience them as beauty. As Bosanquet interprets this view, it means that all that symbolizes in sensuous form laws eternally active ranks as beautiful. This symbolization need not involve any symmetry or order or proportion in the symbol — indeed the One itself has no parts, and can consequently share in none of these qualities. Whereas on the Aristotelian view only that which possesses structure can be beautiful, Plotinus holds that nothing can partake of beauty whose parts are not beautiful in themselves.

Plotinus is the last of the ancient thinkers to have added anything really new to the theory of æsthetics. With the rise of Christianity and the barbarian incursions from the north and east, art and the theories of art to which it gives rise enter on a period of retrogression. Save as a tool of religion art is dormant until the wonderful centuries that foretoken the Renaissance. As a consequence, although we do find treatments of æsthetic problems from the time of St. Augustine to that of St. Thomas, these have been singularly arid and without fruit in modern æsthetic theory. It is remarkable, however, that the Renaissance itself, fertile in artistic interest and artistic production as perhaps no other time has been, should have left so small a contribution to the æsthetics of to-day, and that it is to the pedantic, dry Enlightenment that we must look for the rebirth of the theory of beauty and art.

As in all the philosophical theories of the Enlightenment, we find a sharp contrast between the empiricistic, Baconian, "tough-minded" tendency of the British speculators and the "tender-minded" rationalism of the Continent. The Continental tradition in æsthetics begins with Baumgarten (1714–62), a follower of Leibniz (q.v., 1645–1716). Leibniz believed that our experience of what is apparently matter is really the result of a confused perception of an aggregate of entities he calls monads, which are essentially spiritual or mental in nature. Accordingly Baumgarten considers that the property of these monads which is known to our intellect as the perfection of the ideas which they possess and the consequent correctness or truth of these is perceived after the confused method of our senses as beauty. It will be seen that this view of Baumgarten belongs to that utter pedantry which characterizes the decadence of the Leibnizian tradition, yet it is the first sign of the renascence of a philosophical æsthetics.

Not many years after Baumgarten we find the question of the norms and branches of art treated by Winckelmann and by Lessing (q.v., 1729–81). Winckelmann's interest is primarily in those arts that appeal to the sense of vision, while Lessing, on the other hand, approaches æsthetics from the standpoint of the poet. Winckelmann has a formal view of the nature of beauty not unlike that maintained by the British artist Hogarth, but he does not make beauty the sole end of artistic endeavor, for he finds that beauty and expressiveness are not perfectly compatible. Lessing follows Winckelmann in applying the word "art" primarily to the plastic arts, so that poetry is for him something quite outside the scope of art. Consequently he is able to maintain that the ugly has its place in poetry, but not in art. Lessing follows Aristotle closely, even pedantically, in his views on the drama and on the relative functions of the several arts.

In Britain at about this time Home (Lord Kaimes) (1696–1782) develops an æsthetical theory on the lines laid down by Shaftesbury and Hutcheson. This view is verbally hedon-

istic, making the test of beauty a certain sense of immediate satisfaction, yet in essence it is not hedonistic at all, for this satisfaction is said to be not only quantitatively but qualitatively distinct from the satisfaction of the useful or the merely agreeable. This view in effect amounts to the postulation of a peculiar æsthetic feeling. Like the Greeks, the members of this school of British thought maintain that the norms of ethics and æsthetics are closely related, but it is the ethical norm which they subordinate to the æsthetic one, for they find the basis of morality in the beauty of good deeds. Edmund Burke develops this empiricistic vein in æsthetics further, and derives the feeling for the sublime from the instinct for self-preservation, that for the beautiful from the social impulse. The technical side of artistic theory is investigated by Hogarth (q.v.), who places great emphasis on the beauty of form or design.

As in metaphysics and in ethics, so also in æsthetics it is the great genius of Kant (q.v., 1724–1804), which unites the twin streams of British and of Continental thought into a single mighty current. He combines the apriorism of Baumgarten with the empiricism of Home. Like Home, he finds the criterion of the beautiful in some kind of pleasure which it excites, but he does not consider this pleasure as a mere feeling. Beauty, he maintains, is that which universally and necessarily arouses disinterested satisfaction by its own form. Or again, he states that whatever pleases universally and without a concept is beautiful. Beauty then is determined by the pleasure it excites in us, but this pleasure must not apply to the sensory qualities of the object, but rather to their mere arrangement, and must be universally and necessarily determined by this arrangement. The nature of the arrangement in question is indicated by Kant when he says that a thing is beautiful when it corresponds to the nature of the cognitive faculty, or when it brings harmony among human faculties. Kant denies that an absolute a priori treatment of the various types of beauty is possible, but he nevertheless attempts what practically amounts to this. One of his most important contributions to æsthetics is that of making the way for a true appreciation of the sublime. He finds that the sublime is that which by its quantitative or qualitative mightiness shocks us and fills us with pain at our own smallness, but then fills us with a feeling of the exaltation of the greatness of our moral nature, which is mightier and loftier than all the splendors of the outer world.

While Kant emphasizes the formal side of the beautiful to the exclusion of the material, the poet Schiller (q.v., 1759–1805) finds the nature of the artistic activity in a mediation between the matter-impulse and the form-impulse, between desire and reason. Art, then, consists of a sort of balancing or play of all the mental faculties. This suggestion was adopted by Spencer (q.v., 1820–1903), who attributes to this play the function of preventing the higher faculties from disuse and the atrophy consequent thereon. The fact that the higher we go in the scale of life the less completely do the bare necessities of life consume the energies of the individual furnishes both the need and the opportunity for a progressive increase in the attention given to play and to æsthetic appreciation.

In the great schools of idealistic philosophy which immediately follow Kant æsthetics plays a large part. According to Hegel (q.v., 1770–1831), art is a synthesis of theoretical and practical action, or subject and object, of cognition and action, of conscious and unconscious activity, of freedom and necessity, of genius and deliberation. Beauty is the shining of the Absolute (cf. the One of Plotinus) through the veil of sense-experience. It is through this intervention of a sensuous medium that beauty differs from truth. The further developments of the Hegelian æsthetics are essentially Platonic.

That arch-pessimist Schopenhauer (q.v., 1788–1860) finds in beauty his respite from the toil and trouble of the world. Beauty is for him the expression of an Idea. Everything is in some measure beautiful. When we contemplate the beautiful we lose our individuality and will, and in so far our dependence on the World-Will. The appreciation of art gives us a partial attainment of the Buddhist Nirvana. The disappearance of will from consciousness takes place on the contemplation of the sublime by an active effort on our part; while when we devote our attention to the beautiful, will merely vanishes of itself.

In Herbart (q.v., 1776–1841) we find a certain affinity both to British subjectivism and to Kant. Beauty, he considers, arouses an involuntary and disinterested judgment of approval. We transfer this predicate of the judgment to the object and call it beauty. This capacity of judgment, or taste, differs from desire in that it can judge that which is present as well as that which is absent. The essential character of the beautiful is its form.

In Britain the early and middle part of the last century received relatively little influence from Kant. Dugald Stewart (1753–1828) and Bain (q.v., 1818–1903) develop a view which shares in all the hedonism of Home and Burke. Bain follows Alison and Jeffrey in attributing to association an important place in the genesis of the sense of beauty. Although in all these writers there is much that is relevant to the modern discussion, this is so bound up with a false and unwieldy psychology that it is hard to isolate.

It is not worth while to arrange the writers of the middle and latter thirds of the last century historically. In England we have that great, paradoxical, sincere genius Ruskin (q.v., 1819–1900). "Art for art's sake" is a doctrine essentially repugnant to him. According to him, the three functions of art are to enforce the religious sentiments of mankind, to perfect their ethical state, and to do them material service. It will be seen that his opinion agrees closely with the practice of that period which furnished so much of his inspiration, the Middle Ages, for then art, like philosophy, was *ancilla Theologiæ*.

In Taine (q.v., 1828–93) as in Spencer, the biological, anthropological consideration comes strongly to the front. Art is largely a matter of environment, and there can be, for example, no talk of the Flemish type of art as bad art, or of the Italian type as good art. The function of art is to make predominant the essential character of the object it depicts. A Dutch

landscape is excellent in so far as it truly conveys to us the misty, foggy air, the rich, marshy fields, the careful husbandry of the Rhine delta.

By Tolstoy (q.v., 1828–1910) art is regarded as a means, not an end, and in this he agrees with Ruskin. Art is a human activity aiming at the transmission of emotion, and is not the pursuit of beauty. Art should not be the exclusive property of one class or one race, and should avoid such subjects as sexual love, patriotism, or religious devotion. Its true function is ethical.

According to Bosanquet (q.v.), the beautiful is "that which has characteristic or individual expressiveness for sense-perception or imagination, subject to the conditions of general or abstract expressiveness in the same medium." Bosanquet finds beauty in chargedness with associated ideas. Here the voice is Hegel's but the hand is Bain's. Beauty is to be judged, not by individual human feeling, but by the *tendency* of human feeling. "Beauty" usually means such beauty as is recorded in art — i. e., by those who perceive best.

According to Bergson (q.v.), art exhibits the intention of life, as opposed to science, which presents its analysis. Art is the sphere of intuition, science that of reason. As Bergson considers the knowledge gained by intuition as deeper and truer than that gained by reason, he assigns a higher place to art in his philosophy than to science. He names sympathy as one of the cardinal marks of art.

Bergson's antithesis between art and science is foreign to the philosophy of Santayana (q.v.), who regards art as plastic instinct which is conscious of its aims. The instinct which constitutes art in Bergson's philosophy need not possess this consciousness. For Santayana art is reason propagating itself. This attitude is not unlike that of Benedetto Croce (q.v.). Croce holds that art is essentially lyrical, and consists in a representation of the feelings. He denies to art all ulterior metaphysical purpose. It should exhibit feelings and not deliberately construct them.

Let us now leave the historical for the systematic part of the discussion. We find that the two cardinal problems of æsthetics are that of the nature of beauty and that of the nature of art. Although art does not always deal with what is *prima facie* beautiful, it would seem difficult to deny that any proper object of art, no matter how great its apparent ugliness, will be beautiful when approached from the standpoint of the artist or the appreciative observer. Although, then, it is easy to formulate paradoxes that appear to point in the opposite direction, we are justified in defining art as that human activity which has as its end the production of the beautiful. This definition does not tacitly introduce the "Art for art's sake" which Tolstoy combats, for it leaves entirely open the question of the independence of beauty from morality, and furthermore does not declare that the attainment of beauty is an end which justifies action. If we admit the validity of this definition, we have left of the two problems of æsthetics but one — that of the nature of beauty.

The most important question which, as we have seen, has historically presented itself as to the nature of beauty is that of its source. This question is completely analogous to that of realism or idealism in epistemology; is beauty something intrinsic in what is perceived, which is only disclosed through the act of perception and not at all altered thereby, or does beauty consist in a relation between the beautiful object and the subject who is aware of it or the act of perception by which it is brought to consciousness? Those who hold views of the first type, such as Plato, Aristotle, Plotinus, Hegel or Bosanquet are called *objective* æstheticians, while their opponents, including among others Home, Shaftesbury, Burke and in a limited sense Kant, are said to be *subjective* æstheticians.

The dispute between subjectivists and objectivists in æsthetics has been full of much confusion. The subjectivists have been accused of degrading their science by making the validity of the æsthetic judgment dependent on the mere passing whim of any self-appointed critic. Without in the least prejudicing the answer to the main question at issue, it may be pointed out that to say that a view is degraded or ignoble is not to say that it is false, and furthermore that a property of an object which is dependent on its relation to a percipient is not necessarily mutable at the will of the percipient. An æsthetic judgment which is dependent, let us say, on my feeling of admiration for a certain statue, is no more under my control for that reason than if it were solely dependent on the physical shape of the statue. As far as my will is concerned, my sentiment of admiration is as immutable a datum as the statue itself. The subjectivist, then, may have canons of taste quite as binding as those of the objectivist, but these canons involve a double reference — a reference not only to the object but to the subject.

Furthermore, a subjective æsthetics need not necessarily identify beauty with pleasantness. The old psychological hedonism which made all the keys of human interest strike one of the twin strings of pleasure and pain is no longer upheld by any respectable authority. It is quite possible that the seat of the dispute between the claims of sensual pleasure and of beauty is within us, and that they are equally parts of our nature. Therefore it is no answer to the subjectivist in æsthetics to say that the beauty of an object is introspectively other than the pleasure it may induce in us, and is often incompatible therewith.

It is through this method of *introspection* or *self-examination*, however, that the true nature of the beautiful is to be discovered, and the question of its internality or externality to be solved. Does recognition of the beautiful enter the mind after the manner of our perception of a quality in an external object — as we perceive that a tree is green and leafy or bare and brown — or after the manner of an awareness of our own emotions, such as anger, satisfaction, contrition, etc.? This is the attitude which should be kept in the mind of the reader throughout the following discussion.

Now, it is a familiar experience that one may be blind to beauty with much more readiness than to an ordinary sensory impression. Wordsworth's Peter Bell found that

> "A primrose by a river's brim,
> A yellow primrose was to him,
> And it was nothing more."

It is obvious that the essential thing which Peter Bell lacked was not sensory acuity. He probably saw as much of the color, form, etc., of the primrose as the poet himself. What was wanting in him was a certain emotional response to the color and form. Furthermore, once this emotional response is present, machine shops or traveling cranes may be beautiful, as is shown by the work of Mr. Pennell, or city slums or barren deserts or in fact anything whatever. It is difficult to avoid the conclusion that in the emotion excited by any object and only in that emotion does its beauty lie.

If we accept this view, we shall be subjectivists, and indeed the trend of the age is in this direction. There are still, however, many diverging types of subjectivism possible. One might say with Kant that though the seat of beauty is in the impression made by an object on the subject, this impression is bound by fixed a priori laws. Yet the very diversity of the beautiful and the fact that nothing appears ugly to him who considers it in the proper light, seem to exclude this view from being a real solution of the problem. But even if we admit that the connection between the beautiful object and the emotion it excites is a de facto one and not a priori, we have not yet pinned our æsthetics down to a single theory. Many maintain that beauty consists in the excitation of some peculiar æsthetic emotion. If we accept the James–Lange theory of the emotions — which has been seriously questioned of late — and maintain that an emotion is individuated only through the physiological response which characterizes it, it will be very difficult to attribute a separate existence to the æsthetic emotions. We react to different works of art in very different ways; one excites awe, another pity; we laugh at the comedy and weep at the tragedy, we exhibit the physical symptoms of admiration for this work and those of the enjoyment of that. It is impossible for a single physiological reaction to be found that is compatible at once with those of awe, pity, laughter, tears, pleasure, admiration, which is not also found in our reactions to things not beautiful. Even apart from the James–Lange theory, the multifariousness of the æsthetic emotions seems to contradict their possession of any common element. It seems, then, that the æsthetic sentiments are qualitatively identical with those of non-æsthetic character. Whatever distinction may subsist between them must be sought elsewhere than in their quality. Perhaps the distinction is to be found here; many of our emotions, such as desire, fear, hatred, satisfaction, etc., have a certain *polarity* about them — they are either emotions of approval or of disapproval. These emotions do not always agree in their direction at different times, or even at one and the same time, we may fear what we desire, or even hate it. Nevertheless, owing to the de facto uniformity of our nature, certain types of things will attract us in the long run and in general, and others repel us, even though these rules may be broken in a large number of particular instances. That is, we possess what may be known as a *taste*, which changes very slowly, if at all. Furthermore, we are able to recognize whether or not a thing will satisfy our taste, regardless of the conflicting promptings of our immediate emotions or of the presence or absence of the thing in question. Now, there are two ways in which we may apply our taste to an object or process; we may consider in its environment in the causal chain, or by a more or less voluntary act we may blot out its actual associates, and look at it in complete isolation. The first is the method of the moral agent, while the second is that of the artist. Here we see why art and morality may differ in their promptings, and also why the artistic attitude has been called disinterested by Kant and so many other writers. If the whole world were summed up in one picture or one symphony, the artist would necessarily be a good man, but it is not, and the very disregard for the loose ends of causality which bind his activities to the rest of the world which makes the artist a genius is likely to interfere with his being completely good. Or to put it otherwise, the artist may have many masterpieces, but the good man only one — his life.

On this theory of art it is easy to account for both the mutability and the fixity of æsthetic taste. Taste with a capital T is formed from the aggregate of individual tastes by much the same process by which these take their origin from the single emotions of those to whom they belong. Taste is that part of personal tastes which is based on what is biologically and culturally common to mankind. Consequently it changes just as rapidly and just as slowly as mankind itself. Of course, in addition to this general human taste, every group of persons has its group taste. There are always certain individuals whose tastes have been more highly developed in the intricacy of their objects and the uniformity of their norms than those of the common run of humanity. These persons indicate the direction which the general human taste will assume with the increase of artistic and cultural education, and accordingly the group-taste of this community is Good Taste. With Bosanquet we may make this Good-Taste the practical norm of æsthetics.

The norm of æsthetics, then, is to be found in the direction in which evolution and education are leading the judgments of mankind. It is because of the de facto permanency of the trends of education and evolution and of human nature itself that art is a social matter — that the works of one man can be appreciated by others — and not because of any a priori character of the beautiful and of art.

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NORBERT WIENER,
Editorial Staff of The Americana.

ÆSTIVAL, es'tēvạl, or **ESTIVAL,** plants whose principal functions, especially the blooming of the flower, occur in summer, are called æstival. Prairie plants are nearly all of this class.

AËTA, ä'ä-tä. See NEGRITOS.

ÆTHEL, ăth'ĕl, prefix in Anglo-Saxon name. See ETHEL.

ÆTHELBOLD. See ETHELBOLD.

ÆTHELHARD. See ADELARD.

ÆTHELING. See ATHELING.

ÆTHER. See ETHER.

ÆTHIOPICA, "Tales of Ethiopia," a Greek romance in 10 books in which is told the story of the love, adventures and final union of Chariclea, an Ethiopian princess, and Theagenes, a Thessalian Greek. The author is a certain Heliodorus of Emesa in Syria, who lived in the latter part of the 3d century A.D., and not, as was until recently believed, Heliodorus, bishop of Trikka in Thessaly. The development of the tale, which is on the whole the best of the extant Greek romances, is extremely complicated, often, though Tasso thought otherwise, unreasonably so. For the author not only adopted the technique of the epic and disclosed subsequently through the speeches of his characters the events which had brought about the situation at the opening of Book I, but he also allows these characters, as they successively appear, to relate their own previous adventures. The tale thus abounds in episodes, amid which the thread of the main story is temporarily lost. There are, besides, countless incidental discussions of matters connected with geography, natural science, war, literature, etc., etc. It may fairly be said that about one-quarter of the 'Æthiopica' is either irrelevant to the story or impedes its progress. The interest naturally depends almost wholly upon the plot and the fantastic adventures in strange lands; there is but little character-drawing. The author displays, however, a remarkable power of pictorial description, especially in those scenes which mark some important turn in the action. Of these probably the most striking is the brilliant scene in Book VII in which the lovers meet again under the walls of Memphis. The 'Æthiopica' exerted no inconsiderable influence upon the fiction of the Renaissance. Tasso greatly admired the structure of the story and drew from it material for his 'Jerusalem Delivered.' In England, Sidney is heavily indebted to it in his 'Arcadia' and Greene shows its influence in his 'Menaphon' and 'Pandosto.' Shakespeare in 'The Winter's Tale' took over from 'Pandosto' some of Greene's borrowings from Heliodorus. The 'Æthiopica' was first translated into English in 1577 by Underdowne from the Latin rendering of Warschewiczki and his version has been reprinted in 'Tudor Translations' (Vol. V, London 1895). A translation from the original Greek is that of Rev. R. Smith (London 1901). Consult also Chassang 'Histoire du roman dans l'antiquité grecque et latine' (Paris 1862); Rohde, 'Der griechische Roman' (Leipzig 1900); Oeftering, 'Heliodor und seine Bedeutung für die Litteratur' (Berlin 1901); Wolff, 'Greek Romances in Elizabethan Prose Fiction' (New York 1912).

NELSON G. MCCREA,
Anthon Professor of the Latin Language and Literature, Columbia University.

ÆTHIOPIS, a Greek epic poem in five books, written by Arctinus of Miletus, one of the earliest poets of Greece and a contributor to the epic cycle. He flourished about 744 B.C. The 'Æthiopis' was so named from the Æthiopean Memnon, who, after the demise of Hector, became the ally of the Trojans. The poem takes up the narrative of the Trojan War from the close of the 'Iliad.' It begins with the famous deeds and death of the Amazon Queen, Pentheseleia, and ends with the death of Achilles and the dispute over his arms between Ajax and Odysseus. Consult Allen, T. W., in *Classical Quarterly* (pp. 82 et seq., April 1908); Lang, 'Homer and the Epic' (1893); Kinkel, 'Epicorum Graæcorum Fragmenta' (1877).

ÆTHIOPS MARTIAL, an old pharmaceutical name for black oxide of iron.

ÆTHIOPS MINERAL, a name sometimes given to the artificial black sulphide of mercury.

ÆTHOGEN, a compound better known as nitride of boron. See NITRIDES.

ÆTHRIOSCOPE, eth'ri-ō-skōp, a form of differential thermometer devised by Sir John Leslie. Both bulbs of the thermometer are enclosed in a concave mirror, one of them being in its focus. The instrument is so sensitive that when directed toward the sky it is affected by a passing cloud. It is not much used at the present time.

AËTIUS, ā-ē'shius, the last great Roman general and savior of western Europe from

being Hun: b. Durostorum on the Danube (now Silistria), c. 390 A.D.; murdered toward the end of 454. He was son of a distinguished commander Gaudentius (probably barbarian); in military service while a boy, and given to Alaric as a hostage after Pollentia in 403, remaining three years; later a hostage to the Huns; and gaining close intimacy with both races, of mixed results. After Honorius' death he supported the secretary Joannes against the Empress-regent Placidia, and brought an army of 60,000 Huns to his aid; but, Joannes having just been defeated and slain, the Huns were bribed to go home, and Aëtius was made Count of Italy and commander of the army, and became the chief adviser and prop of Placidia and her children. His main rival was Boniface, Count of Africa, at Carthage; and the accepted story is that by a base double intrigue he drove him into revolt and calling the Vandals from Spain into Africa; that on discovering the fraud Boniface fought in Italy first a slight battle and then a duel with Aëtius, was mortally wounded, and in dying counseled his wife to marry no one but his rival. It is very suspicious; but any way the Vandals overran North Africa; Boniface was killed; Aëtius in 432 had to flee to the Huns, came back the next year with an army of them, was reinstated, and for the next 17 years was the ruling spirit in the Western Empire, battling in Gaul with Visigoths, Burgundians and Franks, upholding by combined soldiership and policy the declining state, with a vigor and genius which made him the one great man of the Roman world in foreign eyes. In 450 the great Hunnish invasion under Attila (q.v.) came rolling down into Gaul with a volume it seemed impossible to stay, and the success of which might have blighted western Europe as their kinsmen the Turks have blighted the eastern portion. Aëtius by his diplomatic skill and knowledge of how to play on the barbarians induced Theodoric the Visigoth to league with him, followed Attila into the Seine valley, and on 20 Sept. 451 checked his progress in the mighty battle of Châlons (q.v.); the empire's last victory, and one of the world's turning-points. Attila's death not long after broke up the Hunnish coalition and delivered the empire from it; but it was also Aëtius' death sentence, and with his the empire's. Valentinian III, Placidia's son, hated Aëtius' power and had only submitted to it from fear of Attila; and, feeling now secure, seized the occasion of a visit of Aëtius to Rome, to arrange the marriage of his son with Valentinian's daughter, and stabbed him with his own hand. The sack of Rome by the Vandals shortly followed; and 22 years after Aëtius' murder the last of a succession of puppet emperors was pulled down by the barbarian Odoacer.

AËTIUS, a Roman theologian of the 4th century surnamed "the Atheist": d. Constantinople 367. He was founder of the Anomœan-Arian sect, named after him the Aetians, who held that the Homousian doctrine of the begotten son as God is self-contradictory, since the nature of God is eternal and unbegotten. He was banished from Alexandria by Constantius in 356, but was called to Constantinople by Julian in 361 and made a bishop.

AËTIUS, ă-ē'shi-ŭs, a Greek physician of the 6th century: b. Amida, Mesopotamia. He became court physician at Byzantium and was author of a voluminous work on medicine in 16 books, based on Oribasius, Galenos and other sources. A complete Latin translation by Cornarius was published (Basel 1542). Consult Zernos, 'Aetü sermo sextidecimus et ultimus' (1901).

ÆTNA. See ETNA.

ÆTOLIA, ē-tō'lia, ancient Greece, a district lying along the north shore of the Gulf of Corinth and having Epirus and Thessaly north, Acarnania west, separated by the Acheloüs and Locris and Doris east, separated by the Daphnus. The only other river of any size was the Evenus. Between it and the Acheloüs lies a marshy but fertile plain separated by the Aracynthus range on the north from a similar plain, of which two large communicating lakes — Trichonis (Apokuro) and Hyria (Zygos) — take up a great part. The rest of the country is crossed in all directions by rugged mountains, covered with forests and intersected by ravines. The plains produced plenty of corn and fine pasture and the Ætolian horses were famous, while the mountain slopes gave excellent wine and oil; but for some reason the tribes never till late in Greek history entered into the fellowship of Greek civilization and then but imperfectly. They were wild, backward, anarchic and untamable; a race of robbers and pirates and the best recruiting-ground in Greece for mercenary soldiers. In the Heroic age, when most other Greeks were like them, and Odysseus' grandfather won distinction as an accomplished *klepht,* they were conspicuous; and Ætolia was the scene of the Calydonian boar hunt. (See MELEAGER). When they reappear in Thucydides' pages on the Peloponnesian war, they are a congeries of unfederated independent tribes, living by plunder and the chase, with few and poor towns — Thermon, Calydon and Pleuron the chief — and taking to the mountains when hard pressed. They had a sort of union like the Iroquois League, for common action against a common enemy, but no corporate accountability and nobody to make a treaty with. After Alexander's death Antipater and Craterus invaded the country; and this, with the great new wealth their general trade of soldiering was bringing in and consequent increase of civilized interests, forced them to strengthen the bond into the Ætolian League, first mentioned in 314 B.C., but of immense weight in later times and chief rival to the Achaian League and Macedonia. Unlike the former, it was a league of tribes, not towns. But like that, it was a democracy nominally, every freeman over 30 having a vote if he could come to the capital and cast it, but an aristocracy or timocracy in practice, only the wealthier being able. There was a Great Council, or Panætolicon, which met yearly at Thermon, elected all magistrates afresh and enacted general laws and voted on foreign policy; a smaller body of Apocletæ, who were in fact a cabinet, who prepared all questions to put before the Great Council and seemed to have been permanent; a chief magistrate, the *strategos* (general), who was not only military commander but president of the assembly, put such questions as he chose (Speaker), was elected annually and was not allowed a vote on the question of peace or war; a *hipparchos* or cavalry com-

mander; and a chief secretary. After the expulsion of the Gauls from Greece in 279, in which the League did good service, it expanded enormously; not like the Achaian League because of the advantages of its membership, but from the exceeding disadvantages of its hostility — for it never lost its piratical character wholly to its latest day. It took in Locris, Phocis and Bœotia, Acarnania, southern Thessaly and Epirus, many cities in the Peloponnesus, Thrace and Asia Minor and the island of Cephallenia; it controlled the oracle at Delphi and the Amphictyonic Council. But its wanton invasion of Messenia (southwest Peloponnesus) in 220 brought the Achaian League and Macedonia both against it; Philip V invaded Ætolia in 218, sacked Thermon with its vast accumulated national treasures and burnt the sacred buildings; and the next year they made peace. In 211 they again provoked a war with Macedonia and again Thermon was captured, peace being made in 205. In 200 they joined Rome against Macedonia and helped to win the battle of Cynoscephalæ, which crushed Philip; but they were so disgusted with Flamininus' settlement of the country without giving them the advantages they expected, that in 192 they made the fatal error of allying themselves with Antiochus of Syria against the Romans. Antiochus was crushed in 189 and the independence of the League came to an end. In 167 the pro-Roman party murdered 550 of the patriot leaders, and the League was dissolved and Ætolia made a Roman province.

AFANASIEV, Aleksander Nikolaievich, Russian folklorist and antiquarian: b. Boguchar, government of Voronezh, 11 July 1826; d. 23 Sept. 1871. He received his education in the gymnasium of Voronezh and at the University of Moscow, where he studied law. At his graduation in 1848 he entered the civil service and took a position in the record-office of the ministry of foreign affairs (1849) and in 1856 became head of the department. He was dismissed in 1862 on the charges of being involved in political affairs. His writings touch upon all sides of Russian-Slavonic tradition. His love for antiquities and mythology shows the indirect influence of Buslayev, who was becoming prominent during Afanasiev's student days. He was more directly influenced by Kavellin and Solovyev whose literary direction he reproduced in his historical treatises, 'State Organization under Peter I,' 'Concerning Patrimonial and Country Estates' (both published in the Archives of Hist. and Juridical Studies). While yet a student he contributed to *Sovremennik* (1849–52), *Otechestvennuiya Zapiski* (1850–60) and several other publications. His most important articles of those days are 'Ancestor-House Demon' (publ. in the Arch. of Hist.-Judicial Studies conc. Russia, ed. by Kalachev); 'Sorcerer and Witch' (publ. in the almanac 'Kometa,' ed. by Schepkin, and as a separate edition, Moscow 1851); 'Zoomorphic Gods of the Slavs' (in *Otechestvennuiya Zapiski* Nos. 1–3, 1852). From 1858–59 he edited the *Bibliographicheskiya Zapiski.* His most important works besides those mentioned are: 'Russian Journalism' (in *Otechestvennuiya Zapiski* 1855; separate edition, Moscow 1859. It is a valuable monograph of century literature dealing with journalism for the period of 1769–74); 'Russian Popular Legends' (1860); 'Russian Folk-Tales' (1860), which is the first scientifically treated collection of Russian fairy tales. In 1866 appeared his 'Poetical Conception of Nature of the Slavs,' which is the first attempt at a scientific and systematic study of Slavonic mythology. This work shows the influence of Grimm, Kuhn, Schwarz and Max Müller. The general criticism of his work is lack of originality.

AFANASIEV, Aleksander Stepanovich (AFANASYEV-CHUZHBININ), Russian novelist and ethnographer: b. Poltava, 1817; d. St. Petersburg, 6 Sept. 1875. Graduating from a gymnasium in 1836, he entered military service but left it with disappointment and the rank of lieutenant (1843). In 1847 he took a civil service position in the office of the governor of Voronezh. Two years later he gave it up and devoted himself entirely to literary work. His first poem 'The Ring' appeared in 1848 under the pseudonym «Chuzhbinin.» In 1856 the government sent him, together with a few other writers, to study the life of the people on Russian sea-coasts. He chose the region of the Dnieper and expounded the result of his studies in his work 'Journey in Southern Russia' (Saint Petersburg 1861) which is a good description of Ukranian life. He wrote a great deal and contributed almost to all Russian periodicals. Not counting his poems, newspaper articles and correspondence, his productions amount to 60 works. He founded in 1864 the newspaper *Saint Petersburgski Listok.* In the seventies he edited *Magazin inostrannoi literaturui* (Journal of Foreign Literature) and the paper *Novosti* (1875). He had also been editing minor periodicals for a period of a few months each. During the last years of his life he was inspector of the museum of Saint Petersburg. His most valuable contributions are his ethnographical works. Besides the work named above, he started a 'Dictionary of the Ukranian Dialect.' He wrote several very successful Ukranian poems ('Tell me the truth, my good Cossack'). His Russian poetry is much inferior. Of his novels those are best which describe military and provincial life. They are written in an interesting style and contain good character sketches of Russian officers. Some of his works besides those mentioned are: 'Recollections about T. G. Shevchenko' (Saint Petersburg 1861); 'Fanya' (ib., 1872); 'Petrograd Gamblers' (ib. 1872).

AFFECTION, in psychology, is a mental element co-ordinate with «sensation.» See FEELING.

AFFIDAVIT, a statement reduced to writing, and sworn or affirmed to before some officer who has authority to administer an oath. An affidavit should refer to the cause in which it is made. The common-law rule is that it must contain the title of the cause. The place where the affidavit is taken must be stated, to show that it is taken within the officer's jurisdiction. The affiant must sign the affidavit at the end. It is necessary that the officer signing the jurat should append his official title.

An affidavit should also describe the affiant sufficiently to show that he is entitled to offer it, for instance that he is a party, or agent or attorney of a party to the proceeding. This

matter must be stated, not by way of recital or as a mere description, but as an allegation in the affidavit.

Affidavit of Defense.—A statement made in proper form that the defendant has a good ground of defense to the plaintiff's action upon the merits.

Affidavit to Hold to Bail.—An affidavit which is required in many cases before a person can be arrested.

AFFILIATION, is a species of adoption which exists in some portions of France and in other European states. The person affiliated succeeds equally with other heirs to the property acquired by the deceased to whom he had been affiliated, but not to that which he inherited. See ADOPTION. As to orders of affiliation in bastardy proceedings, see BASTARD.

AFFINE TRANSFORMATION, a-fīn', in geometry, a transformation by means of which every point in a plane receives a displacement whose direction is parallel to a given fixed straight line called the axis of affinity, and whose magnitude is proportional to the distance of the given point from that axis. The affine transformation is projective; that is, it transforms every straight line into a straight line.

AFFINITY. *In law,* the connection existing in consequence of marriage between each of the married persons and the kindred of the other. By the marriage one party thereto holds by affinity the same relation to the kindred of the other that the latter holds by consanguinity; and no rule is known to us under which the relation by affinity is lost on a dissolution of the marriage more than that by blood is lost by the death of those through whom it is derived.

Affinity is distinguished from consanguinity, which denotes relationship by blood. The degrees of affinity are computed in the same way as those of consanguinity.

In Chemistry.— The tendency manifested by certain substances to unite with one another so as to produce new combinations, chemically different from the primitive ones. The word was originally applied in this sense in the belief that some obscure and undiscovered "affinity" or relationship existed between the combining substances; but it now appears probable that the contrary is more nearly true, and that the tendency toward combination is strongest, generally speaking, between bodies that are quite dissimilar; though it is impossible to lay down any fixed rule of this simple kind. The modern theory of chemical affinity is too elaborate to be treated adequately under a single heading. See CHEMICAL AFFINITY; DISSOCIATION; ELECTROLYSIS; EQUILIBRIUM, *Chemical;* MOLECULAR THEORY; SOLUTION.

AFFIRMATION, the act of affirming, in the sense of solemnly declaring in a court of law that certain testimony about to be given is true. Also, the statement made. First the Quakers and Moravians, who objected on conscientious grounds to take oaths, were allowed to make solemn affirmations instead; now everyone objecting to take an oath has the same privilege; but, as is just, false affirmations, no less than false oaths, are liable to the penalties of perjury.

AFFRE, Denis Auguste, afr', dė-nē ō-güst, French ecclesiastic: b. 27 Sept. 1793; d. 27 June 1848. From his prudent and temperate character he was made archbishop of Paris by Louis Philippe's government in 1840. Though not yielding blind submission to all its measures, he abstained from offensive opposition; and when a republic was proclaimed in 1848 he kept aloof from political strife, but displayed earnest zeal for the public welfare. During the June insurrection he climbed on a barricade in the Place de la Bastile, carrying a green bough in his hand as messenger of peace; but he had scarcely uttered a few words when the firing recommenced, and he fell mortally wounded, to die next day. He wrote several theological works and one on Egyptian hieroglyphics.

AFGHANISTAN, af-gan'i-stän, Asia, lit. "The country of the Afghans" is the term which, in the present day, designates those regions governed by the Amir of Kabul. The name "Afghan" is supposed to signify "noisy or tumultuous." It is very ancient in its origin and has gradually been assumed by the subjects of the Amir. During the Afghan conquest of India they were known as Pathans and Rohillas, terms which are still used in India to denote people of Afghan origin.

Topography.— Afghanistan, as it now exists, embraces the country between the River Oxus and the Indus, and consists of ranges of snow-covered mountains, deep ravines and valleys. Many of the valleys are well watered and very fertile. The surface on the northeast is covered with the lofty ranges of the Hindu Kush which reach 20,000 feet above the level of the sea. The total length of this range of mountains is estimated at 365 miles. The dominions of the Amir as now defined by various boundary commissions lie on the northwest frontier of India, and are bounded on the north by Russian Turkistan, on the west by Persia, on the south by Baluchistan and on the east by Cashmere and British India. It has an area of about 250,000 square miles and a mixed population estimated at 6,000,000. The rivers are very numerous. Among them are the Oxus, or Amu-daria, which separates Afghanistan from Russian territory; the Murghab, which rises in the Afghan hills and flows through the city of Merv; the Helmund watering the valleys of Afghan Turkistan; the Hari Rud, which waters the valley of Herat and runs a course of 245 miles to the Seistan Lake; the Kabul River, which flows from the city of Kabul and enters the Indus at Attok; the Kuram and the Gomal rivers, which enter the Indus in British territory; the Lora which flows through the Peshin valley and is 200 miles in length. The only lake of importance is the Ab-i-Stada on the Ghilzai plateau about 65 miles from Ghazni. It stands at a height of 7,000 feet. It is about 44 miles in circuit and very shallow.

Provinces and Cities.— Afghanistan is divided into five provinces — Kabul, Herat, Kandahar, with chief cities of the same name, Afghan-Turkistan and Badakshan; and two territories — Kafiristan and Wakhan. The province of Kabul is bounded on the northwest by Koh-i-Baba, on the north by the Hindu Kush, on the northeast by the Pangsher River and on the east by Jagdalik. It is very mountainous, but it also has large sections of rich

arable land. A very large portion of the population live in tents during the summer months. Herat extends from near the sources of the Hari Rud River on the east to the Persian frontier on the west. The Herat valley is most fertile, and it has been estimated that it is capable of supplying an army of 150,000 men. Kandahar is a most important province of the country. It extends over a wide area from Ghazni to the Persian frontier, and includes that part of Seistan which belongs to the Amir. Afghan-Turkistan was formerly the ancient province of Balkh but has now assumed its present condition through the treaty arrangements with Russia and Great Britain. The province of Badakshan lies to the extreme east of the kingdom and is bounded on the northeast by the River Oxus and on the south by the Hindu Kush. It consists of lofty mountain ranges and deep rugged valleys in which there is but little agricultural development. In the winter the climate is severe and the mountain passes are blocked by snow. Wakhan consists of two valleys watered by the Panja River. It is too elevated and sterile for tillage. Its lowest hamlet is 8,000 feet above the level of the sea.

Lines of Communication.— From India to Afghanistan there are four well-known lines of communication. The first is from the railway terminus at Peshawar through the Khybar Pass. The second from Thul through Bannu over the Paiwar and Shutturgardan passes to Kabul. The third through the Gullair Surwandi and Sargo passes to Ghazni. The fourth from the railway terminus at Quetta to Kandahar via the Bolan Pass.

There are four distinct lines by which Russia can move on to Herat: First from the Caspian by the Mashat route; second from Chikishliar by the Bendessan Pass and across the desert to Merve; third from Tashkend via Gherjuit; fourth by Balkh direct to Herat. The distance from Peshawar to Kabul is 191 miles in 20 stages varying from 8 to 12 miles. From Kandahar to Herat is 365 miles. From Herat to Balkh 370 miles. From Kabul to the Oxus by Balkh 424 miles.

Climate.— As might be expected in a country having the physical conditions of Afghanistan there is the greatest variety of climate. In some parts, especially north of Kabul, the winter is rigorous. In the city of Kabul the snow lies for two or three months and the people seldom leave their houses. At Jalabad the climate is similar to that of the plains of India and the heat is intense in summer. Throughout Kandahar the summer heat rises to a very high temperature, but at Herat, although much lower than Kandahar, the climate in summer is more temperate and in winter much milder. The salubrity and charm of some localities is much praised by the people, although they have by no means that immunity from disease which the dry climate of the country and the fine physical condition of the people might lead us to suppose. Fevers are common, stone is frequent, and eye diseases prevail.

Natural Productions.— Afghanistan is supposed to be rich in minerals. Small quantities of gold have been taken from the streams flowing from the Hindu Kush. There were at one time famous silver mines in Badakshan. The ruby mines which lie some feet above the Oxus River have a world-wide reputation, but the deposits have not been worked regularly. There are rich lead mines in Herat. Coal has been found near Ghazni. Silicate of zinc comes from the Kaki country. Sulphur abounds in Herat on the confines of Seistan. Sal-ammoniac is found in Seistan. Gypsum exists in large quantities in Kandahar. Nitre abounds in almost every part of the land.

Vegetable Productions.— On the Alpine ranges of the country there is a magnificent growth of forest trees — cedars, pines, hazels and walnuts; and growing under the shade of these trees are rich varieties of honeysuckle, currant, gooseberry, hawthorn and rhododendron. The wild rose is found in all parts of the land and is an important export. Lemons and wild vines are in abundance. In cultivated districts the chief trees are mulberry, willow, poplar and ash. An important product is gum resin which grows abundantly in Kandahar and Herat. In the highlands of Kabul edible rhubarb is a local luxury. Walnuts grow wild and are exported with the pistachio nut to both India and Russia.

Agriculture.— In most parts of Afghanistan there are, as in India, two harvests. One of them is called the "Baharak" or spring crop, which is sown at the end of autumn and reaped in summer. It consists of wheat, barley and a variety of lentils. The other harvest is called "Paizah," and is sown at the end of the spring and reaped in autumn. It consists of millet, maize, beets, turnips, etc. The staple food of the country is wheat, but rice is largely imported from Peshawar. The growth of melons, especially of the "sarda melon," is an important cultivation as they are exported to Peshawar. Sugarcane is grown in the plains, and cotton in the warmer sections of the country. Tobacco is very widely cultivated and exported to Russia and India. The fruit crops are abundant. Every kind of European fruit — pears, apples, peaches, oranges and grapes are produced in many varieties and of excellent quality. Mulberries are reduced to flour, and when prepared in cakes form the staple food of many districts. Grapes are cultivated to a very high degree. They are placed in boxes protected with cotton wool and exported in large quantities to India. The vineyards and peach gardens at Kandahar and Herat are very productive.

Industrial Products and Trade.— Silk is produced in Kabul, Kandahar and Herat, and although it is largely consumed in domestic manufactures the best qualities are exported to Bombay. Excellent carpets, soft, brilliant and durable in color, are made in Herat and are very often sold in America as "Persian carpets." They are woven by the Nomads of the desert, and by the girls and women while the men are tending their flocks on the hills. Of recent years the Amir has given great attention to the manufacture of all kinds of articles, and English artisans have been brought into the country for promoting various industries. The chief exports of the country are wool, horses, silk, fruit, madder and asafœtida. Under the fostering care of the Amir the exports of Afghanistan are very rapidly on the increase.

Animals.— Bears, jackals, hogs, monkeys, leopards, wolves, hyenas, wild dogs and cats are among the wild animals of Afghanistan. The wild ass is found in the southwest part of the country. During the breeding season Afghanistan appears to be the retreat of a variety of birds. Camels are frequently employed, although they cannot travel in rainy weather or through snow. The two-humped Bactrian camel of historic lineage is still seen. Horses are a staple export to India, especially the "Yabu," a stout heavy-shouldered pony about 14 hands high. The breed has been much improved as they are used for the cavalry of the Afghan army. The cows are the humped variety of the east and the dairy produce is an important feature in Afghan diet, especially the pressed and dried curd called "krut." There are two varieties of Afghan sheep both having the fat tail. One bears a white fleece and the other a russet or black one. The export of wool is very largely cultivated. Goats are also valuable on account of their hair which is used in the manufacture of shawls. Dog breeding is cultivated by the Afghan nobles as they are used in the sports of the field, especially for turning up quail and partridge for the hawk, hawking being a popular sport among both the nobles of Persia and Afghanistan.

The People.— The origin of the Afghans is involved in obscurity and has given rise to various opinions. Some have supposed that they are descended from the soldiers of Alexander the Great whom he left in these countries. Others affirm that the Copts of Egypt or the Chaldæans and even the Armenians were their ancestors. The Afghans themselves maintain that they are of Jewish origin descended from Afghana who was in lineal descent from Abraham and Hagar by their son Ishmail. Some Afghan authors affirm that Afghana was the grandson of King Saul. Some writers state that they are descended from Jewish prisoners sent into the mountain by Nebuchadnezzar. It is related that when Nadir Shah marching to India arrived at Peshawar, the chief of the Yusufzai tribe presented him with a Hebrew Bible. There is no trace of Israelitish origin in the Afghan language (see *Language and Literature*), but there is not a single Afghan, from the Amir on the throne to the tiller of the soil, who does not believe that he is one of the "Beni Israil." Of the Afghans proper there are numerous clans, somewhat similar to the clans of the highlands of Scotland. Of these the most important are the Durranies, originally called Abdalis, who received the name from their famous clansman the poet king, Ahmad Shah. The Barakzais are a powerful tribe represented by the present reigning dynasty. The Gilzais were supreme in power at the beginning of the 18th century and are still a powerful clan, occupying the high plateau of Kandahar. The Yusufzais inhabit a district called Yusufzai in Pashawar valley. The Kizilbashes are Persianized Afghans who came into the country in the time of Nadir Shah. The Hazaras, living in a district of that name, came from the east with the army of Ghenjiz Khan. They have Mongolian features, and speak a Persian dialect. The Hinkis are people of Hindu descent. They are the merchants and bankers of the country and being idolaters they pay a poll tax, according to Muhammadan law, and are denied many privileges. In religion the Afghans are of the Sunni sect of Islam, and in jurisprudence belong to the Hanafi school of interpretation. The Kizilbashes are of the Shiah sect of Moslems. The people of Kafiristan are idolaters who are being rapidly converted to Islam.

As a race the Afghans are exceedingly attractive to the western traveler. They are handsome and athletic. They have fair complexions with aquiline features and long flowing beards. The women are exceedingly fair and handsome, and more intellectual than the average woman of the East. In cities they are rigidly secluded, but in outlying districts they are free to roam and are often employed in the field.

The Afghan, familiar with bloodshed from his boyhood, makes a valiant soldier, and there are many Afghans who have attained to high positions in the Anglo-Indian army. "The avenger of blood" is an institution among the Afghans and it is a point of honor for the next of kin to avenge a murder. With the Afghans hospitality is the very salt of life, and the ordinary salutations of the people bear this character. When passing along a road the mounted chieftain salutes the weary traveler with "may you never be tired," to which the man on foot responds "may you ever be prosperous." On approaching the village "Hujrah," or guest house, the traveler is received by the host with the welcome of "may you ever come," to which the guest replies "may you ever remain master of this house." When the guest departs he is escorted to the village boundary and is sent on his way with the salutation "may God protect you."

The Afghans of to-day believe that their nation has a great future in harmony with the noble traditions of the past and they believe that they will again become a great and powerful nation. They are shut in by Russia on the one side and by Great Britain on the other, and in consequence of the British conquest of Baluchistan and Sind they have been deprived of a seaport. But they hope against hope and consequently avoid committing themselves to either Russia or Great Britain, and pose as the enemies of Persia.

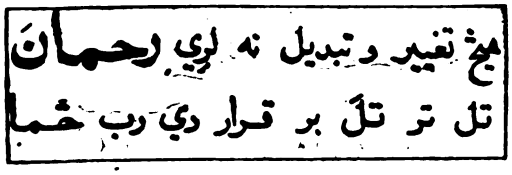
Language and Literature.— The national language of the Afghans is Pashto, or Pakhto, Pushto, or Pukhto, Pushtu, or Pukhtu, the pronunciation varying in different tribes. It is an Aryan or Hindu-Persian language, written in the Arabic character, with three letters peculiar to Pushto. It is only of late years that the language has been expressed in writing with a system of phonetic spelling. Specimens of Afghan prose and poetry are found in the "Kalid-i-Afghani," a work compiled for the use of students in 1872. As the Afghans claim an Israelitish origin Oriental scholars have thought that there were traces of Hebrew in certain Afghan words, but these words, without exception, have been brought into the language through the religious terminology of Islam.

Pushto is the spoken language of the people in the Trans-Indus territories of British India, including Peshawar, also in the province of Kandahar, and among the hills between the

provinces of Kabul and Kandahar and British India. Persian is the language of the educated classes.

The earliest English grammar of Pushto was compiled by Prof. Bernard Dorn of the Imperial Russian University of Kharhov in 1829. There are Pushto grammars by Captain Vaughan, Maj. H. G. Raverty, Dr. Henry Walter Bellew and Dr. Trumpp; Pushto dictionaries by Dorn, Raverty and Bellew.

There must be a very large number of Pushto manuscripts in existence stored away in the mosques of the country, where native calligraphists employ their time in copying them. Peshawar has been the literary centre of the Afghan language. The earliest work discovered in Pushto is a history of the conquest of Swat by Shaikh Mali Yusufzai, A.D. 1413. There is also a history of Bunair by Khawjah Khan. In the reign of Akbar, 1600, Bayazid Ansari, known as Pir Roshan, the "enlightened saint," wrote several works in Pushto. There are also several books, chiefly religious, by his contemporary Akhund Darweza. In Hughes' textbook there is a selection from the Tarikh-i-Murassa, the "gem-studded history" by Afzal Khan Khattak, who was a voluminous writer. His grandfather, Khushhal Khan, chief of the Khattaks, translated about a hundred works from Persian into Pushto, and he is also the author of a "Diwan" of poetry of very high merit. He died in 1691 and is buried at Isuri, near Attock. Ahmad Shah, the founder of the present Afghan monarchy, was a poet of some reputation. The popular poet of the Afghans, whose "Diwan" is read wherever the Afghan language is spoken, is Abdur Rahman, who resided near Peshawar at the beginning of the 18th century and whose grave is to be seen at Hazarkhana, two miles from Peshawar.



A STANZA FROM DIWAN-I-ABDUR RAHMAN.

The Christian scriptures have been translated into Pushto by William Carey, the Baptist missionary, 1825, Isidor Lowenthal, an American Presbyterian missionary 1862, and in 1886 by a committee of missionaries working under the supervision of the late Thomas Valpy, French bishop of Lahore 1886.

Government and Administration.— When Amir Abdur Rahman ascended the throne in 1880 the greatest confusion prevailed in every department of political, civil and military administration, while the supremacy of the Amir at Kabul was scarcely recognized by the chieftains of the various tribes. But with statesmanlike ability, supported as he was by the British government, he succeeded in establishing a permanent government. It consists of a board of treasury, a board of trade, a bureau of justice, a department of police, a public works department, a postal system and a department of education. The government is conducted by a supreme council known as the "durbar." This council has three sections. First the "Durbar-i-Shai," or such members of the reigning family as are invited by the Amir. Second, the "Khawanin," or assembly of Maliks and chieftains. Third, the "Ulima" or representatives of the Mullahs or Moslem priesthood. The Amir is seldom absent from the council, and its assembling depends entirely on his pleasure. The Amir's cabinet consists of the lord of the seal, the commander-in-chief, the lord treasurer, the postmaster-general and the chief secretaries of departments. The laws are those established by the Moslem religion, the "Pukhtanwali," or peculiar customs of the Afghan people, and the supreme will of the Amir. Amir Abdur Rahman gave his closest attention to revenue and in order to establish the currency of the country he opened a mint in Kabul. The annual revenue is unknown but it probably amounts to a sum equal to $5,000,000 which includes the subsidy received from the government of India. According to the old system the Afghan army was composed entirely of tribesmen collected by their Maliks who were supposed to hold their land on condition of military service. At the present time the regular army is estimated at 150,000 men, consisting of a royal bodyguard of four regiments of infantry and three regiments of cavalry, a regular army of 80 regiments of infantry, 40 regiments of cavalry and 100 batteries of artillery. The police force consists of 30,000 men, and the tribal auxiliaries are about 30,000. When placed on a war footing it is thought that the Amir could put in the field at least a half million men, because every Afghan is by birth and education a soldier, a man of war from his youth.

History.— For many centuries this country was the centre of history. First, as the seat of powerful Buddhist kingdoms, and then as the highway of Moslem conquest. In the time of Darius Hystaspes, B.C. 515, these regions embraced the Achemenian Satrapies, and among them a district known as Paktyes, which must have been on the right bank of the River Indus now known as the district of Yusufzai, and the Peshawar valley. This is undoubtedly the origin of Pukhtun which is the oldest name of the country of the Afghans, and is still retained in the designation of their language.

Alexander the Great marched to Herat, the ancient Artacoana, the capital of Aria, and proceeded to Zarangae on the banks of the Helmand. He then advanced to "a country among the snows in a barren land" which seems to have been the mountain regions of Kabul and Ghazni. After retiring to the foot of the Caucasus for the winter he advanced to Bactria, the modern Balkh, and proceeded to Kabul, from whence he marched down the left bank of the Kabul River and crossed the Indus probably at Hund near Attock.

The Ariana mentioned by Strabo, about the beginning of the Christian era, must have occupied the limits of the present Afghanistan. In 310 B.C. an Indian king named Chandragupta ruled the province of Kabul. In 250 B.C. there was an independent Greek dynasty in Bactria (Balkh). The ancient coins, and the old Buddhist ruins show evidences of this, and when the old ruins at Balkh have been excavated very interesting historical facts will be made known

regarding this Greek kingdom in Central Asia. At present we know but little regarding it.

Demetrius, B.C. 190, reigned in Arachosia after being expelled from Bactria. Eucratides, 181 B.C., reigned in the mountain region. Under Heliocles, 147 B.C., the Parthians extended their conquests through the country into India. In 126 B.C. Meander invaded India. The Chinese accounts of the time when Bactria was overrun by Scythian invaders are supposed to be very extensive although they have not yet been translated into western languages. Chinese historians say there was a nation called Yuchi settled in the Oxus valley in 126 B.C. In the travels of the Chinese pilgrim Hwen Tsang in the 7th century we have accounts of the country now known as Afghanistan. In 630 A.D. he says there were both Indian and Turk rulers in the Kabul valley.

The first attempts of the Moslem conqueror to bring these regions to the faith of the Prophet of Arabia were unsuccessful. It was not until 977 A.D. that Subuktigin the Turk conquered the country and established his capital at Ghazni and founded what is known as the Ghaznevi dynasty. His son was the famous Mahmud of Ghazni who in 1001 invaded India, and in course of time established Afghan rule both at Lahore and Delhi. He is credited with having made 12 expeditions to India. His tomb is still to be seen at Ghazni. The Ghaznevi dynasty was succeeded by that of Ghor or Ghur which transferred the capital of the empire to Herat. Muhammad Ghori ruled Afghanistan in the 12th century and made Delhi the capital of his kingdom. About 1220 Genghiz Khan, the great Mogul ruler of the Tartars, marched through Afghanistan and displaced the Ghor dynasty. In 1398 Timur made himself master of Central Asia, and crossing the Indus plundered the Panjab as far as Delhi.

Baber, who was sixth in descent of Timur, captured the city of Kabul in 1504, and made it the capital of his empire. He was eventually killed and his body was carried from Agra and interred in Kabul where his tomb is still to be seen. His son Humayun was defeated and driven out of India in 1540, but in 1555 he again mounted the throne at Delhi, and at his death was succeeded by Akbar, the greatest of the Mogul emperors of India. The Afghans gave Akbar much trouble. When the power of the court of Delhi was weakened, Kandahar with a large part of Afghanistan fell under the power of the Shah of Persia. Nadir Shah was proclaimed King of Persia in 1736. He seized the city of Kabul as one of the main gates of India, and then leading his army through the Khybar Pass entered the Peshawar valley and there defeated the imperial forces. Ahmed Khan, a general of the Saddozia clan, seized the treasury at Kandahar, and was crowned King of the Duranis about 1747. With Ahmed Shah commences the history of Afghanistan as an independent nation. He reigned 26 years and was succeeded by his son Timur, who in 1773 removed the seat of government from Kandahar to Kabul. He reigned 20 years, and died in 1793 leaving three sons. The youngest son, Shah Shujah, eventually ascended the throne and made Peshawar his capital. In 1800 the Tsar of Russia and Napoleon Bonaparte concocted a scheme for the invasion of India, and consequently the British government sent Mr. Monstuart Elphinstone as ambassador to Shah Shujah at Peshawar and concluded a treaty in 1809.

The Barakzai tribe, under the leadership of Fateh Khan, deposed Shah Shujah, who fled from Peshawar to seek protection at Lahore, where the Sikh ruler Runjit Singh extracted from him the famous koh-i-nur diamond, which eventually became the property of the English sovereign. In 1826 Dost Muhammad became Amir of Afghanistan, founding the present dynasty of Afghan rulers. Dost Muhammad obtained supreme power, and establishing himself as Amir, entered into negotiations with Russia. This led to the invasion of Afghanistan by a large British force in 1838 and the establishment of Shah Shujah as king. Dost Muhammad was sent to India a prisoner of the British government. In November 1841 Sir Alexander Burns and his suite were assassinated and a few days later Sir William MacNaghten shared the same fate. In January 1842 the British army retreated to India and was completely annihilated, with the exception of Dr. Bryden, who was brought in half dead to Jalalabad on 13 Jan. 1842, the sale survivor of an army of 5,000 men and 12,000 camp followers. In April two British forces were sent to avenge the massacre, a column under General Pollock by way of the Khybar Pass and another column under General Nott by way of the Bolan Pass. The British evacuated Afghanistan in October 1842 leaving Shah Shujah ruler of the country. Shah Shujah was assassinated, and the British having released Dost Muhammad from prison, he was restored to the throne. During the mutiny of the native army in India in 1857 Amir Dost Muhammad proved a valuable ally to the British. The British government engaged in war with Persia in behalf of the ruler of Afghanistan and eventually restored the province of Herat to Afghan rule.

Dost Muhammad died June 1863 and was succeeded by his son Shir Ali. Consequent on the nomination of Shir Ali, who was not the eldest son of the deceased Amir, a rebellion broke out and for a time Afzal Khan and Azim Khan, the elder sons of the Dost, reigned conjointly as Amirs. Eventually Shir Ali became firmly established on the Afghan throne and in March 1869 visited Lord Mayo, viceroy of India, at Umballa.

Amir Shir Ali Khan being suspected of intrigues with Russia a British force commanded by Gen. Donald Stewart invaded Afghanistan in 1878. On the death of Shir Ali February 1879 he was succeeded by his eldest son, Yakub Khan. A treaty with Amir Yakub Khan and the British government was signed at Gandamak by Colonel Cavagnari representing the English government and the Amir in May 1879. By this treaty an extension of the British frontier was secured and the residence of a British envoy in the city of Kabul was sanctioned. In accordance with this treaty Sir Louis Cavagnari proceeded to Kabul accompanied by his secretary, Mr. Jenkins, Dr. Ambrose Kelly and Lieutenant Hamilton. On 4 September the troops of the Amir demanded payment and attacked the British embassy, killing Cavagnari and his three companions.

As a result of this outrage a third Afghan

war began on 6 Sept. 1879 and an expedition under the command of General Roberts marched to Kabul arriving 28 September. The murderers of the British embassy were executed and Amir Yakub Khan was deported to India. Afghanistan for a few months was under British military rule, but in July 1880 Abdur Rahman Khan, the eldest son of Afzal Khan, who was the eldest son of Amir Dost Muhammad Khan, was recognized as Amir at a durbar in which the British government was represented by Sir Lepel Griffin. On 27 July 1880 occurred the "disaster" of Maiwand when the British force under the command of General Burrows was totally defeated by Sardar Ayub Khan, a brother of the late Amir Shir Ali. General Roberts made his celebrated march for the relief of Kandahar, leaving Kabul 8 Aug. 1880 and arriving at Kandahar 31 August, he totally defeated Ayub Khan on 1 September. On 30 Sept. 1881 the British evacuated Kandahar and Amir Abdur Rahman took possession of the province. In 1883 the Amir was granted a subsidy of 12 lakhs of rupees. In 1885 Amir Abdur Rahman attended a conference with Lord Dufferin, viceroy of India, at Rawalpindi, and received the British decoration of G. C. M. G. Numerous boundary commissions were held during the years 1887 and 1888 in which the frontiers both on British territory and also those of the Russians were clearly defined. A final agreement was reached by negotiations carried on by Sir Mortimer Durand in Kabul 1893 and the subsidy granted to the Amir was increased by six lakhs of rupees. In 1894 the Amir was invited to England by Queen Victoria, but being unable to leave his country, he sent his second son, Sadar Nasr Ullah Khan. On 1 Oct. 1901 the Amir died and was succeeded by his eldest son, Habib Ullah Khan, who, in a treaty with the British, assumed the position of the independent sovereign of Afghanistan and is now honored with the title of "His Majesty" in all treaty documents. In January 1907 Amir Habib Ullah visited Calcutta to meet Lord Minto, the viceroy of India. The Amir's eldest son and heir is Sardar Inayat Ullah Khan, who was born 1888.

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HENRI F. KLEIN.

AFIUM-KARA-HISSAR, ą'fē-oon'ką-rä'-hĭs-sär, Turkey in Asia, city of Anatolia, 180 miles northeast of Smyrna by rail; also connecting with Konieh, Angora and Constantinople. At the junction of several caravan routes, it carries on an extensive Oriental and European trade in general merchandise. It has manufactures of saddlery, carpets, felts and arms, and opium is largely produced in the neighborhood. Pop. 20,000.

A FORTIORI, an argument derived from what is stronger; an argument more potent than that which has just before been employed. When in Euclid it is reasoned, that much more than is the angle B D C greater than the angle B C D, the use of the words much more implies that the *à fortiori* argument is used.

AFRANCESADOS, the partisans of Napoleon in Spain and the Spanish colonies.

AFRICA, second in size of the six continents, with a continental area of 11,262,000 square miles and islands of 239,000 more, has the Mediterranean north, the Atlantic west, the Red Sea and Indian Ocean east, the Antarctic Ocean south; and lies nearly due south of Europe and southwest of Asia. It extends from lat. 37° 20′ N. to 34° 51′ S., and long. 17° 32′ W. to 51° 28′ E., being nearly equal in length and breadth from its extreme points; from Cape Blanco in Tunis to Cape Agulhas in Cape Colony is nearly 5,000 miles; from Cape Verde in Senegal to Cape Guardafui in Somaliland about 4,600. The northern section, however, has an average breadth nearly double that of the southern, owing to the great northern projection of the upper part, the western coast taking a sudden inward turn and facing south for nearly 20 degrees of longitude, forming the Gulf of Guinea.

General Topography.— From its junction with Asia at the Isthmus of Suez, the north coast runs west by a little north to the Strait of Gibraltar, its nearest approach to Europe, whose Mediterranean shore it faces, and whence for many centuries it derived its principal civili- narrow expanse of the Red Sea; further south the Gulfs of Cabes and Sidra. From the Isthmus south the coast runs somewhat southeast, parallel to Arabia, separated by the long narrow expanse of the Red Sea; further south it projects well to the east, overlapping the south coast of Arabia and again running nearly parallel to it, the two forming the Strait of Bab-el-Mandeb and the Gulf of Aden. From the terminus of this projection at Cape Guardafui, the coast trends southwest with slight undulations to the south extremity of the continent. About midway, separated from the mainland by the Mozambique Channel, 250 miles wide, lies the great island of Madagascar. Save those named, Africa has no great indentations, and the coast line is very small relatively to its size; about 16,000 miles, a fifth less than that of Europe absolutely, and between one-fourth and one-fifth as great relatively. The southern extremity presents to the Southern Ocean a coast line of nearly 400 miles excluding indentations, compendiously known as "the Cape," first doubled by Bartholomew Diaz and Vasco da Gama. Its principal indentations are Algoa Bay and False Bay. The islands belonging to Africa are not numerous, and except Madagascar none of them large. In the Atlantic Ocean there are Madeira, the Canaries, the Cape Verde Islands, the Bissagos, the islands off the coast of Guinea, Fernando Po, St. Thomas, Annobon, etc., Ascension Island, St. Helena and Tristan d'Acunha; in the Indian Ocean, Sokotra, Zanzibar, Seychelles, Amirante, Comoro Isles, Madagascar, Mauritius, Réunion, with their dependencies; and some small islands in the Southern Ocean.

Northern Africa.— The interior of Africa forms two great divisions nearly corresponding with the external diversity of form already indicated. The northern section has its greatest extension from east to west, the southern from north to south. The northern division lies for the most part above the 6th degree of north latitude, extending from the Atlantic on the west to the Somali coast and the Red Sea on the east. Its principal feature is the Sahara or Great desert, which is inclosed on the north by the elevated plateau of Barbary and that of Barca, on the east by the Nile valley, on the west by the Atlantic Ocean and on the south by the Niger and the countries of the Sudan. The north coast region (plateau of Barbary) is traversed by the Atlas system and its continuations, rising to the height of 13,000 feet or even more. Exclusive of the mountains it has an elevation of from 1,500 to 3,000 feet. From Barca, where the former level prevails, it descends gradually toward Egypt. The character of the desert, though sufficiently inhospitable, is much less uniformly monotonous than till recent researches it was commonly reputed to be. Instead of an undeviating sandy plain irregularly interspersed with speck-like oases it contains elevated plateaux and even mountains with more or less permanent streams, and habitable valleys which lose themselves in the vast low-lying tracts of sand with which the more elevated regions alternate. The desert itself is furrowed with *wadis* (dry river-beds) radiating in all directions; while under the sand collections of water have been found, which by means of artesian wells have been turned to account by the French in their dependency, Algeria. A considerable nomadic population is thinly scattered over the habitable parts of the desert, and in the more favored regions there are settled communities. (See SAHARA). To the south of the Sahara, and separating it from the plateau of southern Africa, a belt of pastoral or steppe country extends across Africa. This region has received the general name of the Sudan and includes the countries on the Niger, around Lake Tchad, and east to the elevated region of Abyssinia.

Southern Africa.— From Lake Tchad the country begins to rise till below the 10th degree of north latitude, where the edge of the elevated plateau of high or southern Africa begins. This division of the continent is, as far as known, completely surrounded, at a distance of 50 to 300 miles from the coast (which is usually low but rising inland), by what look like ranges of mountains varying in breadth and height; but which are really the escarpment of a tableland, or series of tablelands, of considerable elevation and great diversity of surface and direction, having hollows filled with great lakes rivaling those of America in extent, and terraces over which the rivers break themselves in falls and rapids. The southern division has, like the northern, a desert region — the Kalahari desert — but it is of small extent compared to the Sahara. In some respects it resembles the Sahara, but possesses more vegetation. The mountains which inclose the south tableland are mostly much higher on the east than on the west, and the slope of the land and the flow of the principal rivers, with the exception of the Zambezi, is from east to west. The east edge of the plateau reaches its highest elevation and greatest extent in the mountainous country of Abyssinia, with heights of 10,000 to 14,000 or 16,000 feet. From this the system extends north in detached ranges or occasional elevations between the valley of the Nile and the Red Sea, with gradually diminishing height to the very delta of the Nile. The east edge of the Abyssinian plateau presents a steep unbroken line of 7,000 feet in height for several hundred miles. This line of elevation extends south toward Lakes Rudolf and Stefanie and thence in a narrow belt and at a lower average level to the northeast of the Victoria Nyanza; it then proceeds in a south direction to Kilima-Njaro, beyond which the plateau merges into the Paré Mountains in the neighborhood of the Pangani River. Immediately to the south of Lake Rudolf, Mount Nyiro rises to a height of 10,000 feet; Mount Elgon, to the northeast of Victoria Nyanza, 14,100 feet; Mount Kenia, 18,370 feet; Kilima-Njaro, 19,300 feet; Mount Meru, to the west of Kilima-Njaro, 14,000 feet The general level of the plateau between Mount Kenia and the lake is from 5,000 to 7,000 feet. To the west of Victoria Nyanza, between Lakes Albert and Albert Edward, Mount Ruwenzori rises to a height of 16,600 feet, and the active volcanic Kirunga Mountains, south of Lake Albert Edward, to 13,000 feet. All these mountains are volcanic in origin, and between Kilima-Njaro and the lake signs of volcanic activity are still visible. The central plateau reaches its greatest average height, over 4,000 feet, in the region embracing the Lakes Victoria, Tanganyika and Nyassa; it forms a broad belt reaching close to the east coast and in an equally broad belt extends from Lake Nyassa to the west coast. Above this are numerous detached heights, like the Rubeho Mountains, west of Zanzibar, the Livingstone Mountains around the north of Lake Nyassa, and the Mlanje heights south of that lake, Mount Mlanje being 9,680 feet. South of the Zambezi occur the Mashona and Matoppo highlands, rising in places to from 5,000 to 7,000 feet. Immediately to the south of the Middle Limpopo a series of mountains begins which, under various names — Zoutpansberg, Libombo, Drakensberg, Compassberg, Schneeberg, etc.— extends along the east and south coast and north to some distance beyond Cape Town. In Natal these rise to 10,000 and 12,000 feet, and in Cape Colony to 7,000 and 8,000 feet; the interior plateau averaging about 4,000 feet, but falling to a lower level in the Kalahari desert. Between the Orange River and the Kunene, and the latter river and the Kongo, the escarpment continues, rising in places to 6,000 and 8,000 feet. The general level lowers considerably as the Kongo is reached. The low coast region extends some distance into the interior along this part of the west coast, the descent from the interior plateau giving rise to the cataracts which so seriously interrupt navigation on the lower Kongo. On both sides of the middle Kongo extends a considerable area which sinks from the generally high level of the interior to an average of only about 1,000 feet. From the Kongo and Kameruns the general level of the coast plateau is broken by the Crystal and other mountains rising to 3,000 and 4,000 feet, culminating in the Kameruns Peak, a volcanic mountain rising to 13,000 feet. On the south of the Benue, in the Atlantika group, and be-

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AFRICA
ENGLAND
LONDON
NETHERLANDS
AMSTERDAM
BERLIN
GERMAN EMPIRE
BRUSSELS
Plymouth
English Channel
Brest
Le Havre
PARIS
Cherbourg
Nantes
Loire R.
Calais
Dover
Leipzig
Frankfort
Breslau
Warsaw
Cracow
Kiev
Kharkov
Don R.
Volga R.
Astrakhan
LAKE ARAL
Amu-darie
Khiva
Bukhara
Merv
Meshed
Ashkabad
Tiflis
Sea of Azov
CASPIAN SEA
TURKESTAN
Dnieper R.
RUSSIA
Rhine R.
Munich
Stuttgart
Prague
AUSTRIA
VIENNA
Budapest
HUNGARY
SWITZERLAND
Odessa
Crimea
Sebastopol
Black Sea
Danube R.
BELGRADE
ROUMANIA
BUKAREST
SERVIA
BULGARIA
SOFIA
CONSTANTINOPLE
Trebizond
Erzerum
Tabriz
TEHERAN
Kashan
Isfahan
Shiraz
Bushire
PERSIA
Bagdad
Euphrates R.
Aleppo
Damascus
Jerusalem
Suez
Port Said
Alexandria
Cairo
Sinai Pen.
Persian Gulf
OMAN
Riad
Hail
Medina
Mecca
Jedda
TROPIC OF CANCER
Red Sea
Benas
ARABIA
Cape Finisterre
BAY OF BISCAY
Santander
Oporto
Douro R.
Bordeaux
Toulouse
Lyons
Loire R.
FRANCE
SWITZERLAND
Milan
Venice
Trieste
Genoa
Florence
ADRIATIC SEA
Marseilles
Corsica
SPAIN
MADRID
Tagus R.
LISBON
Barcelona
Valencia
BALEARIC Is.
SARDINIA
ROME
Naples
Brindisi
Cape St. Vincent
Seville
Malaga
Gibraltar
Strait of Gibraltar
Tarifa
Ceuta
Tetuan
Algeciras
Oran
Algiers
Bona
Tunis
Bizerta
Cape Bon
Sicily
Messina
Palermo
Syracuse
Malta (Br.)
Tripoli
Lepanto
Corinth
ATHENS
Smyrna
ASIA MINOR
Angora
Salonica
Durazzo
Scutari
Cape Spartivento
Cape Carbonara
Cape Blanco
Cape Bojador
Cape Juby
Cape Ghir
Cape Mirik
Cape Tenes
Cape Matifou
Algiers
Philippeville
Bougie
Djidjelli
Bona
La Calle
Gulf of Gabes
Gulf of Sidra
Cyprus (Br.)
CRETE
Port Said
Alexandria
Rosetta
Damietta
Derna
Tobruk
Marsa Matruh
Sollum
Mersa Brega
Agedabia
Benghazi
Bomba
Gulf of Sidra
MEDITERRANEAN SEA
MADEIRA Is. (Port.)
Funchal
PORTO SANTO
DESERTAS
AZORES (Port.)
ST. MICHAEL
STA. MARIA
CANARY Is.
PALMA (Sp.)
TENERIFFE
GRAN CANARIA
FERRO
LANZAROTE
FUERTEVENTURA
Santa Cruz
Villa Cisneros
MOROCCO
Rabat
Fez
Mequinez
MEKINES
Tangier
Tetuan
Arzila
Larache
Mazagan
El Arish
Gaza
Jaffa
Suez
Sinai Pen.
Cairo
Giza
Beni Suef
Medinet-el-Fayum
Minia
Assiut
Girgeh
Keneh
Esneh
Assuan
Berber
Korosko
Wady Halfa
Abu Hamed
Dongola
Merawi
Ondurman
KHARTUM
Wad Medani
Sennar
Gondar
Adua
Antalo
Makalla
Aden
Ader (Br.)
Gulf of Aden
Sokotra I. (Br.)
C. Guardafui
Ras Hafun
Ras Mabber
Gursne
Negro Bay
Illig
Berbera
Zeila
Djibuti
Harar
Milmil
Warsandab
Obbia
Darerto
Somaliland
Br. Somali Land
Abyssinia
Adis Abeba (Ethiopia)
Lake Abaya
Lake Abaya
Jimma
Goma
Gore
Lake Rudolf
Lake Stefanie
Lake Margherita
Lake Abbe
Lake Gardula
Lake Zwai
Lake Tana
Gondar
Gallabat
Kassala
Sabderat R.
Gash R.
Tokar
Suakin
Sanakin
Ras Kasar
Massawa
Arkiko
Sana
Mokha
Makalla
Aden
Gulf of Aden
Red Sea
Nubian Desert
Libyan Desert
Egypt
Anglo-Egyptian Sudan
Kordofan
Dar Fur
El Fasher
El Obeid
Kolkol
Dara
Towalsha
Shekka
Tira
Kodok
Fashoda
Bahr el Ghazal
Bahr el Zeraf
Bahr el Jebel
Nile R.
Mongalla
Lado
Rejaf
Yei
Yambio
Meridi
Yei R.
Kaka
Kafia Kondj
Kafia Kondj Mts.
Kulusa
Kulusa Mts.
Kuku
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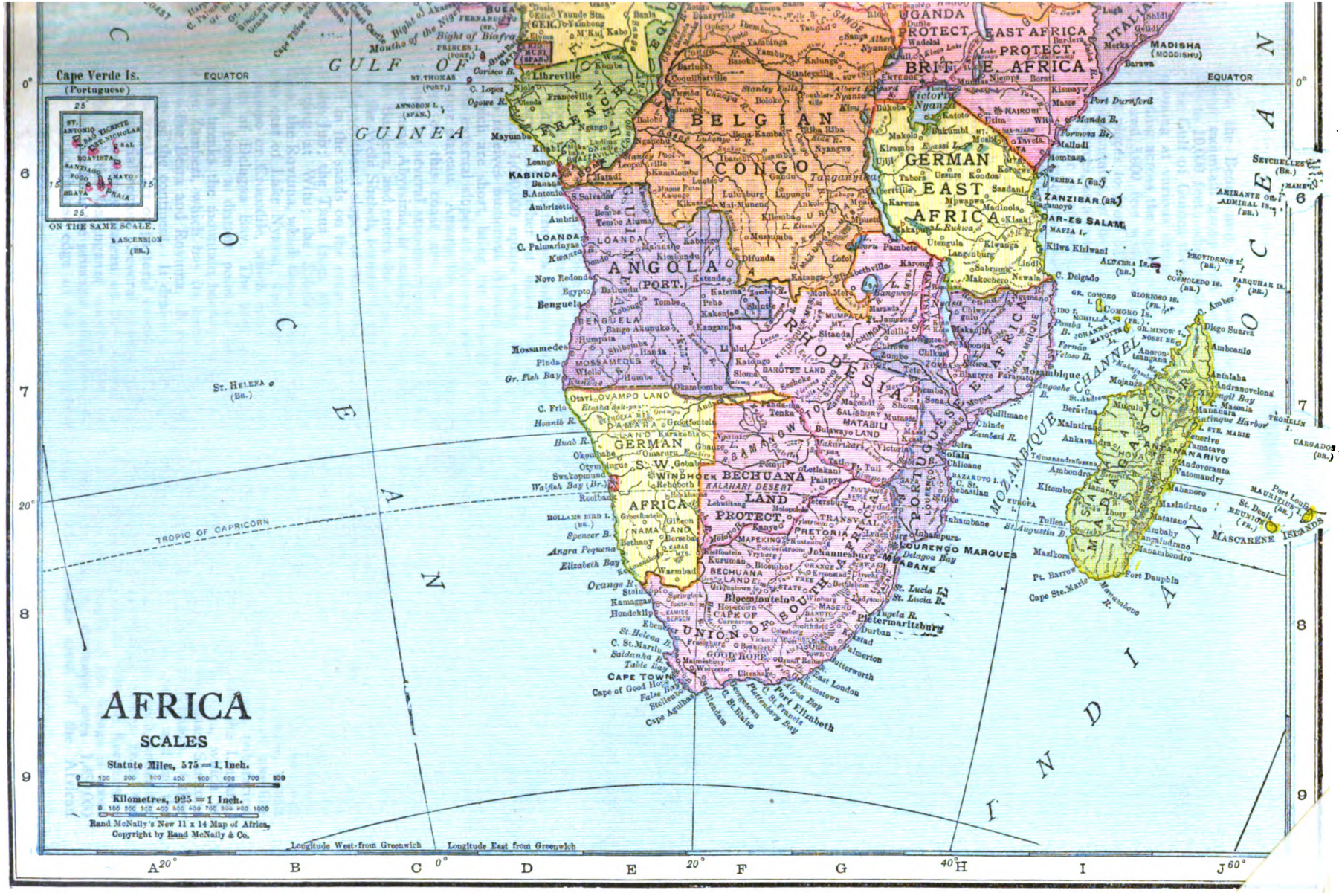
Kuku Mts.


AFRICA
SCALES
Statute Miles, 575 = 1 Inch.
Kilometres, 925 = 1 Inch.
Rand McNally's New 11 x 14 Map of Africa,
Copyright by Rand McNally & Co.
Cape Verde Is.
(Portuguese)
ON THE SAME SCALE.
EQUATOR
GULF OF GUINEA
ATLANTIC OCEAN
INDIAN OCEAN
TROPIC OF CAPRICORN
BELGIAN CONGO
GERMAN EAST AFRICA
UGANDA PROTECT.
EAST AFRICA PROTECT.
BRIT. E. AFRICA
ANGOLA (PORT.)
RHODESIA
BECHUANA LAND PROTECT.
GERMAN S.W. AFRICA
UNION OF SOUTH AFRICA
MOZAMBIQUE CHANNEL
MADAGASCAR
MASCARENE ISLANDS
Longitude West from Greenwich
Longitude East from Greenwich

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20°
0°
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EUROPE
ASIA
AFRICA
ENGLAND
FRANCE
SPAIN
PORTUGAL
GERMAN EMPIRE
AUSTRIA HUNGARY
RUSSIA
TURKEY
PERSIA
ARABIA
BLACK SEA
CASPIAN SEA
MEDITERRANEAN SEA
RED SEA
PERSIAN GULF
BAY OF BISCAY
ATLANTIC OCEAN
ASIA MINOR
TURKESTAN
MOROCCO
ATLAS MTS.
ALGERIA
TUNIS
TRIPOLITANIA
CIRENAICA (BARCA)
LIBYAN DESERT
EGYPT
SOUTHERN TERRITORIES
RIO DE ORO
SPANISH SAHARA
TANEZRUFT
TIBESTI
LIBYAN DESERT
ANGLO-EGYPTIAN SUDAN
FRENCH WEST AFRICA
SENEGAL
FRENCH GUINEA
PORTUGUESE GUINEA
GAMBIA
SIERRA LEONE
LIBERIA
IVORY COAST
GOLD COAST
DAHOMEY
NIGERIA
BORNU
SOKOTO
BAGIRMI
WADAI
KORDOFAN
DARFUR
ABYSSINIA (ETHIOPIA)
ADIS ABEBA
ERITREA
BR. SOMALI LAND
ITALIAN SOMALI LAND
FRENCH SOMALI LAND
ADEN
GULF OF ADEN
TROPIC OF CANCER
Cape Finisterre
Bay of Biscay
English Channel
Strait of Gibraltar
Cape St. Vincent
Cape Juby
Cape Bojador
Cape Blanco
Cape Mirik
Cape Verde
Cape Palmas
Cape Three Points
Cape Bon
Cape Matapan
Cape Malea
Cape Spada
Cape Colonna
Cape Passero
Cape Carbonara
Cape Corso
Cape Bianco
Cape Guardafui
Cape Mosse
Cape Negro
Cape Blanco
Cape Ras Hafun
Cape Ras Mabber
Cape Gurane
Cape Negro Bay
Cape Obbia
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Azores (Port.)
Madeira Is. (Port.)
Canary Is. (Span.)
Funchal
Santa Cruz
Las Palmas
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Fez
Oran
Algiers
Tunis
Bizerta
Constantine
Bona
Biskra
Batna
Tripoli
Misda
Derj
Nalut
Ghadames
Ghat
Murzuk
Sokna
Sirte
Benghazi
Derna
Tobruk
Barca
Jarabub
Audjila
Siwa
Farafra
Dakhla
Kharga
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Medinet-el-Fayum
Beni Suef
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Esne
Assuan
Berber
Khartum
Omdurman
Metemma
Kassala
Asmara
Massawa
Suakin
Sawakin
Jeddah
Mecca
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Teheran
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Merv
Ashkabad
Bukhara
Khiva
Amu-daria
Aral Sea
Lake Aral
Astrakhan
Volga R.
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Kharkov
Kiev
Dniester R.
Odessa
Crimea
Sebastopol
Azov
Sea of Azov
Caucasus
Tiflis
Batum
Trebizond
Erzerum
Angora
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Constantinople
Gallipoli
Dardanelles
Sea of Marmora
Salonica
Athens
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Cyprus (Br.)
Malta (Br.)
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Loire R.
Seine R.
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Belgrade
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Bulgaria
Sofia
Montenegro
Servia
Adriatic Sea
Balearic Is.
Majorca
Minorca
Ivica
Sardinia
Corsica
Elba
Sicily
Malta
Gozo
Pantellaria
Lampedusa
Linosa
Canary Is.
Lanzarote
Fuerteventura
Palma
Ferro
Gran Canaria
Tenerife
Madeira Is.
Porto Santo
Desertas
Azores
St. Michael
Sta. Maria
Graciosa
Terceira
Pico
Flores
Corvo
Tagus R.
Douro R.
Ebro R.
Rhone R.
Po R.
Tiber R.
Arno R.
Nile R.
Blue Nile
White Nile
Atbara R.
Sobat R.
Gazelle R.
Bahr el Ghazal
Bahr el Arab
Shari R.
Logone R.
Benue R.
Niger R.
Senegal R.
Gambia R.
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Congo R.
Ubangi R.
Kasai R.
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Tugela R.
Juba R.
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Lake Chad
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Volga R.
Ural R.
Aral Sea
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Khiva
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Ashkabad
Merv
Meshed
Teheran
Tabriz
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Ispahan
Shiraz
Bushire
Bussora
Euphrates
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White Nile
Blue Nile
Nile R.
Arno R.
Tiber R.
Po R.
Rhone R.
Ebro R.
Tagus R.
Douro R.
Loire R.
Seine R.
Rhine R.
Danube R.
Dniester R.
Dnieper R.
Don R.
Volga R.
Ural R.

AFRICA
SCALES
Statute Miles, 575 = 1 Inch.
0 100 200 300 400 500 600 700 800
Kilometres, 925 = 1 Inch.
0 100 200 300 400 500 600 700 800 900 1000
Rand McNally's New 11 x 14 Map of Africa.
Copyright by Rand McNally & Co.
Cape Verde Is. (Portuguese)
ON THE SAME SCALE.
ASCENSION (BR.)
ATLANTIC OCEAN
INDIAN OCEAN
GULF OF GUINEA
EQUATOR
TROPIC OF CAPRICORN
BELGIAN CONGO
FRENCH EQUATORIAL AFRICA
ANGOLA (PORT.)
GERMAN S. W. AFRICA
BECHUANALAND PROTECT.
UNION OF SOUTH AFRICA
SOUTHERN RHODESIA
NORTHERN RHODESIA
NYASALAND PROTECT.
PORTUGUESE EAST AFRICA
MOZAMBIQUE CHANNEL
BRIT. E. AFRICA PROTECT.
UGANDA PROTECT.
GERMAN EAST AFRICA
ITALIAN SOMALILAND
MADAGASCAR
MASCARENE ISLANDS
SEYCHELLES (BR.)
ST. HELENA (BR.)
Longitude West from Greenwich
Longitude East from Greenwich
348

tween the Benue and the Niger, we find a broken mountain group with heights of from 6,000 to 10,000 feet; while in the interior north of the Gulf of Guinea there is a broad plateau, beginning at various distances from the coast, extending across the upper Niger, and rising to 2,000 and 3,000 feet with irregular ranges rising at places to from 5,000 to 7,000 feet. The Kong Mountains, in the region where the Niger has its sources, as a range do not exist. As the middle Niger is approached the general level lowers to that of the Sahara, while north the low coast region extends far into the interior till the Atlas is reached.

Rivers.— The Nile is the only great river of Africa which flows to the Mediterranean. It is now known to receive its waters primarily from the country drained by the great lakes, the Victoria Nyanza, the Albert Nyanza and the Albert Edward Nyanza, and especially from the Victoria Nyanza, which itself receives numerous streams. The Victoria Nile connects the Victoria and the Albert Nyanza; and on leaving the latter the river flows in a winding course, of which the direction is almost due north, without further lake expansion, to the Mediterranean. In descending from the lake elevations (of the Victoria 3,900, of the Albert Edward 3,200 feet, the latter connected by the Semliki River with the Albert 2,300 feet) it makes, both between the lakes and in its subsequent course, numerous falls. Those in upper Egypt are known as the Cataracts. Between lat. 5° and 10° north, under the name of Bahr-el-Jebel, it receives numerous tributaries, mostly from the country to the south and west; the principal on the left bank being the Bahr-el-Ghazal, on the right the Sobat. After this it takes the name of the White Nile, and receives through the Bahr-el-Azrek and Atbara, or Blue Nile and Black River, the drainage of Abyssinia. The Atbara brings the mud which forms so precious a deposit in Egypt. After this the Nile flows for 1,200 miles to the sea without receiving a tributary. Altogether it drains an area of more than 1,600,000 square miles. The Indian Ocean receives numerous African rivers, most of which are short, being the drainage merely of the external slopes of the escarpment of the interior plateau. Among the most considerable rivers on this coast are the Jub, which is formed by several streams rising in the border slopes near Abyssinia, is navigable with difficulty to Bardera, and enters the ocean at the equator; the Webi Shebeli, formed by streams rising on the southeast slopes of Abyssinia, and losing itself in the sands on the coast near the mouth of the Jub; the Tana from Mount Kenia discharging at Witu; the Sabaki south of the Tana; the Rovuma, which flows from the mountains east of Lake Nyassa; the Beira; and the Limpopo or Crocodile, which enters the ocean north of Delagoa Bay. The only great river flowing from a distant point of the interior which breaks the mountain barrier of the east is the Zambezi, which has its embouchure between the Beira and Rovuma. It is the fourth in size of the continent. It drains a large part of the great tract of pastoral country south of the equatorial region. Several streams coming from the swampy plateau on the borders of Lunda and the Garenganze country unite to form the Zambezi, the principal being the Liba from the southwest edge of the Garenganze country. In its middle course it is joined by the Kafue and Loangwe from the north and the Shiré from Lake Nyassa, and by the Chobe and some smaller streams from the south. Below the Chobe are the Victoria Falls, one of the greatest cataracts in the world; from which the river flows in a semi-circular course to the ocean, breaking through the Lupata Mountains, and discharging by several mouths, the most navigable of which is the Chinde. The river is navigable by vessels of some size to the Karoabassa Rapids beyond the Shiré, but above that only by boats and canoes. The drainage area of the Zambezi is 550,000 square miles.

Of the Atlantic rivers, the Senegal, Gambia and Niger have their origin in the mountains near the coast of Senegambia. The Senegal flows in a northerly and westerly direction, its volume varying much according to the season. In the rainy season it is navigable for 500 to 700 miles, in the dry season for about a fourth of that distance. The Gambia takes a winding course to the west, and is navigable for about 400 miles, nearly its whole extent. The greatest of these rivers, the Niger, rising in the inner slope of the same mountains, flows northeast to Timbuktu, whence it turns first east and afterward southeast, receiving the Sokoto, to its junction with the Benue, which comes from the mountains south of Lake Tchad. The upper part of the Niger is called the Joliba, and is flanked by several great swampy lakes; it afterward acquires the name of Quorra or Kawarra. In the northern part of its course it touches on the great desert. It is navigable for light vessels above Timbuktu. Between the Sokoto and the Benue it is interrupted by shoals and rocks to below Boussa. From the junction it flows due south to the ocean, where it forms a wide alluvial delta and enters by a number of mouths, the most distant of which are 200 miles apart. The main channel is called the Nun. The drainage area of the Niger is 810,000 square miles. The Kongo, the second in extent of basin and the greatest in volume of the African rivers, flows from different slopes of the same watersheds as the Zambezi. Its identification with the Lualaba, the great stream discovered by Livingstone in the centre of the continent, was established by Stanley in 1876–77, this enterprising traveler having descended the river to the Atlantic from a point in the interior west of Tanganyika. The Lukuga, the outlet of Lake Tanganyika, discovered by Cameron, is a tributary of the Lualaba. The Chambeze, which rises in the mountains between Lakes Nyassa and Tanganyika, is the remotest source of the Kongo system. It falls into Lake Bangweolo, from which it issues under the name Luapula and flows north to Lake Mweru; from the north side of this lake issues the Lualaba, which passes through a magnificent series of lake-like expansions and receives numerous tributaries. Below Stanley Falls it receives the Lomami, and above Stanley Pool the Kwa, which is formed by the junction of the Kasai-Sankuru system with the Lukuallu or Kwango. Other tributaries come from the south and in the north it is fed by the Ubangi, which, under the name of the Wellé-Makua, comes from the water-parting between the Nile and Kongo systems. The total length of the Kongo is about 3,000 miles, and its drainage area 1,450,000 square miles. Unlike most of the African

rivers, the mouth of the Kongo forms an estuary. It is estimated to pour into the ocean a larger body of water than the Mississippi. The Kwanza rises in the Mossamba Mountains and curves northwest to the ocean. Like most African rivers, its upper course is interrupted by cataracts, and its mouth closed by a bar. The Kunene rises on the opposite side of the same watershed and flows southwest to the Atlantic. From it south to the Orange River follows a dry belt, through which no considerable river flows to the sea. The Orange, though it rises near the east coast, and flows nearly across the south part of the continent, passes for the greater part of its course through a desert region, receiving no tributaries, and is a shallow stream. Its headwaters, the Vaal and the Nu Gariep, rise on opposite slopes of the Drakenberg Mountains and flow to their junction round opposite sides of the Orange River Colony. The Great Fish River, which drains Great Namaqualand, enters the Orange River near the termination of its course.

The rivers which reach the ocean do not account for the whole drainage of Africa. There are two great and numerous smaller tracts from which no large river reaches the sea. The two great areas of internal drainage correspond with the two great deserts. That of the north desert is estimated at 4,000,000 square miles. As already indicated, it is furrowed with watercourses in every direction, which lose themselves in the sand. The Bahr-el-Ghazal, which is usually dry, but intermittently flows out of Lake Tchad, terminates in a salt lagoon on the border of the desert to the north of the lake. In the south the Zuga or Botletle, which forms the outlet of Lake Ngami, in the Kalahari desert, loses itself in salt lagoons at greater or less distance, according to the supply of water. A region of inland drainage, with salt lagoons, also exists between the Victoria Nyanza and the coast range of mountains. In the low coast land east of Abyssinia the Hawash River loses itself in the sands before reaching the sea; and the Webi, as already stated, which flows south from the Somali Peninsula to near the equator, likewise terminates in a salt lagoon on the border of the ocean. The Omo flows into the north end of Lake Rudolf.

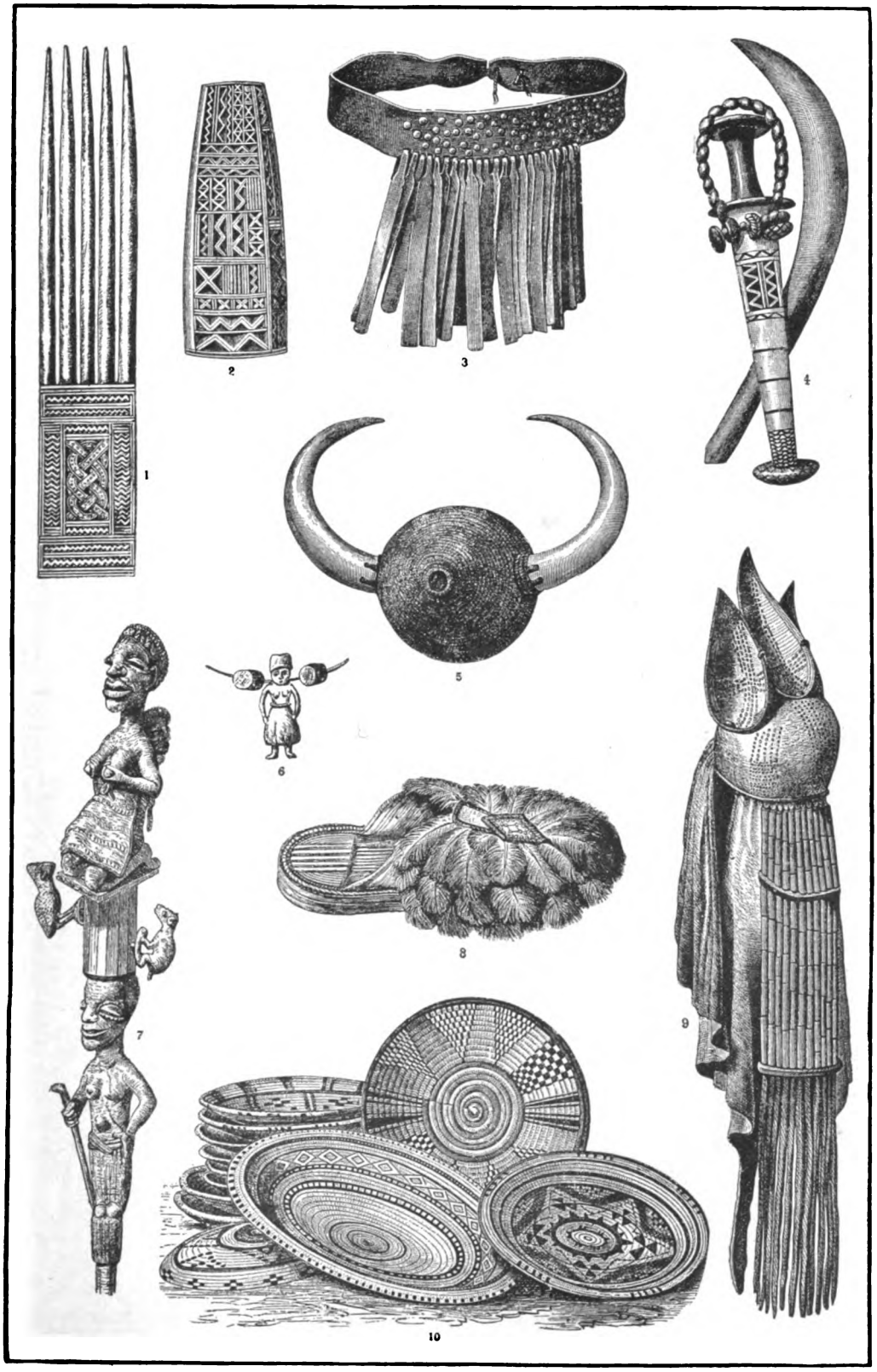
Lakes.— The only lake of considerable extent north of lat. 5° N. is Lake Tchad, an enormous flooded swamp subject to great variations of level and area (10,000–20,000 square miles), which until 1911–12 seemed to be drying up but since then has slowly increased in size. Lake Tsana in Central Abyssinia, the salt Lake Asal in the east and Lakes Dembel and Abayo in Gallaland, are comparatively small. Between 5° N. and 15° S. is a series of lakes forming one of the most striking features of the continent. Almost in a line, beginning in the south, are Lakes Nyassa, Tanganyika, Lifu, Albert Edward, Albert, all lying in more or less elongated rifts or gorges. The series is continued by Lakes Rudolf (salt) and Stefanie in the northeast, and, according to some authorities, by the ancient lake now the Red Sea and by the Dead Sea in Palestine. The great Victoria Nyanza, c. 32,167 square miles, the largest fresh water lake in the world after Lake Superior, which touches the equator on the north, is of a different type, as are Lake Bangweolo (another flooded swamp) on the south of Tanganyika and Lake Mweru in the north of Bangweolo. Lake Rikwa or Leopold, between Nyassa and Tanganyike, is partly of the rift type, while Lake Ngami in the Kalahari region is a swamp which sometimes dries up. Lake Leopold II and Lake Malumba are attached to the lower Kongo. Lake Dilolo is in the swampy region forming part of the watershed between the Kongo and the Zambezi. There are numerous salt lagoons in the northern portion of the Sahara.

Climate.— The climate of Africa is mainly influenced by the fact that, except the countries on the north and south coasts, it lies almost entirely within the tropics. The equator, as already observed, cuts it nearly through the middle, so that it belongs in latitudinal, though unequally in longitudinal extension, to the north and south tropics. It is the only continent which extends unbroken from the north to the south tropics and is consequently the hottest of all. The two sections north and south of the equator have, as has already been observed, in some respects a very considerable resemblance in their general features, the chief modifying circumstances being the greater elevation and the smaller longitudinal extension of the southern division, which, by bringing it more within the influences of the ocean, tends to modify its climate.

In the belt immediately under the equator, both north and south, vegetation is intense and rain abundant. For about 10 degrees north and south we find true tropical forests, mainly to the west of the great lakes, on the middle and upper Kongo and its affluents and along a belt of the west coast in the Niger region. To the east of the great lakes, where the rainfall is not so abundant, are considerable areas of poor steppe and scrub country, and generally over the tropical region the trees are scattered and the country more park-like than forestal. Animal life, from herds of elephants to innumerable swarms of insects, abounds in these luxuriant regions. To the north and south of the equatorial belt, as the rainfall diminishes, the forest region is succeeded by open pastoral and agricultural country. This pastoral belt extends, in the north, across the Sudan, from Senegambia to Abyssinia; on the south from Angola and Benguela to the Zambezi. This is followed by the rainless regions of the Sahara on the north and the Kalahari desert on the south, extending beyond the tropics and bordering on the agricultural and pastoral countries of the north and south coasts, which lie entirely in the temperate zone.

The winds and rains in Africa are chiefly produced by the successive exposure of the various intertropical belts to the vertical rays of the sun. The south winds on the west coast and the monsoons of the Indian Ocean exercise the principal modifying influence. From March to September the southwest monsoon blows from Africa to Asia, and during the remaining months the northeast monsoon blows toward the African coast. The indraught of air charged with moisture, at the seasons when the sun is overhead, produces the rainy seasons within the tropics, and as the incessant rarefaction of the air by heat continually draws in fresh supplies, the rainfall is on the whole abundant, varying from 50 to 100 inches in the region between 10° N. and the Tropic of Capricorn. In a patch

AFRICAN ART



1 Horn Comb
2 Battle Axe
3 Woman's Girdle
4 Club and Dagger
5 Head Ornament
6–7 Fetich Figures
8 Woman's Sandal
9 Woman's Head-Dress
10 Basketry

on the Gulf of Guinea the rainfall exceeds 350 inches, though in Somaliland there are almost rainless patches. Near the tropics, to which the sun comes only once a year, there is only a single rainy season, while in the central part of the zone, which the sun traverses twice in his passage between the tropics, there are two distinct rainy seasons, a greater and a less, according as the wind is in a direction which brings more or less moisture, except in some places in the interior, where the two rainy seasons are so protracted as to blend into one, lasting, as in the Manyuema country, from September to July, or in some other parts even longer. The rainy season usually begins soon after the sun has reached his zenith, but on the east coast the monsoon charged with the moisture of the Indian Ocean brings it earlier. In the deserts, as already observed, there is hardly any rain; and this applies also to Egypt, which but for the Nile would be no better than the Sahara. The chief cause of the rainlessness of the deserts is the direction of the winds, which causes the chief moisture-bearing currents to pass, before reaching them, over hot and thirsty regions which deprive them of their moisture; and especially the mountain screens which intercept the moisture of the winds both from northeast and southwest. Another cause is the want of elevated regions to attract the moisture actually contained in the atmosphere, as in the higher regions of the desert periodical rains do occur. The high mountains of the east plateau and the intervening tropical regions deprive the northeast monsoon of all its moisture before it reaches the Kalahari desert. Hence the apparently anomalous circumstance that the greatest heat is found after the equatorial region is passed. The rapid radiation of heat in the desert causes a very great fall of temperature after the sun is down, so that sometimes frosts are generated, and this in some measure supplies the want of rain by condensing the moisture in dew. In the desert, too, scorching winds are generated full of fine particles of sand, those of the north afflicting Egypt and the countries on the Mediterranean coast and those on the west coast known as the harmattan. The average summer temperature in the Sahara is 97 degrees or more; the hottest part is in Nubia, where the Arabs say the soil is like a fire and the wind like a flame. The coasts of tropical Africa, especially the west coast, where colonial settlements have been formed, have been found to have a deadly climate for foreigners.

Geology and Minerals.— The geology of Africa is little known. Very ancient crystalline rocks are found rising into mountain ranges and sometimes spread over large areas. Most of the rocks that overlie them belong to the older formations, so that the continent as a whole is supposed to be of very ancient date. The sands which cover so large an area are believed to be mainly of æolian origin, and not to have been formed by the action of water. The porous clay found so abundantly in West Africa is of comparatively recent date. The region around Tanganyika is of Jurassic origin. Around the great lakes are abundant evidences of enormous volcanic activity at no very remote date; and, as already mentioned, active volcanoes are not unknown. Tanganyika, according to recent views, may at one period have been connected with the sea. Salt is abundant, though often scarce from want of communication and working organization. Gold is found in abundance in southern Africa from the Transvaal region to the Zambezi, and a number of very productive mines opened up industries in the Transvaal and Mashonaland. Diamonds have been found in large numbers, and in apparently inexhaustible supply, on the Vaal River and its tributaries, in Cape Colony and Orange River Colony. In the southern central district, particularly the country of Katanga, iron and copper are found, and are worked in some districts in the countries bordering on the Lualaba. Copper is also found in Loanda, iron in Angola, and lead, tin, iron and copper in Great Namaqualand; iron, copper and coal are found in Natal and Cape Colony.

Vegetation.— The centre of Africa possesses, as already mentioned, an exuberant tropical vegetation. In the equatorial districts dense forests are found with trees of enormous size and luxuriant climbing plants. The open pastoral belt at the extremities of the tropics is distinguished by a rich and varied flora. A special characteristic of the vegetation of the southern extremity of Africa is the remarkable variety, size and beauty of the heaths, some of which grow to 12 or 15 feet and form miniature forests. Cycadaceæ and bulbous and orchidaceous plants, aloes and other succulent plants also abound. The baobab or monkey-bread tree, first discovered by Adanson in Senegal, is found from the Sudan to Lake Ngami. Acercias, Euphorbias and palms of one variety or another are diffused over almost every part of Africa. The date palm is the special characteristic of the desert, to which it is peculiarly adapted, and there it forms the principal means of subsistence. It is also cultivated as a garden plant in the northern coast regions. This district as well as Egypt has an ancient celebrity for its fertility in grain. Wheat and maize are cultivated, fruit trees also abound, and groves of oranges and olives relieve the landscape. The castor oil plant, the fig tree, the dwarf palm and the lotus, formerly an important article of food, are here characteristic forms. The common oak, the cork oak and the pine form the staple, and the cypress, myrtle, arbutus and fragrant tree heaths the ornaments of the woods. The pastoral tropical belt presents a different order of vegetation. Besides the baobab, the cabbage palm, the oil palm, the wax palm, the shea butter tree, the cotton tree, the African oak and the mangrove here prevail; rice and maize are cultivated; the principal fruits are the banana, pawpaw, custard apple, lemon, orange and tamarind. Many valuable timber trees and India-rubber plants are found in various forms, as trees and as climbing plants, in abundance both in east and west tropical Africa. The prevalent plants of this district are also found in the fertile parts of Nubia. To the northeast of this region frankincense, myrrh, cinnamon and cassia abound. The coffee plant is a native of the southern Abyssinian region, and also of western tropical Africa, where it forms thick woods. This plant is supposed to have been transported from Africa to Arabia. Abyssinia, though coffee and spices are native products, possesses generally,

from its elevation, the vegetation of a temperate region. The swamps of the tropical region abound with papyrus. The cassava, yam, pigeon-pea and ground-nut are cultivated as bread plants.

Animals.— The fauna of Africa is extensive and varied, and numerous species of mammals are peculiar to the continent. According to a scientific view of the geographical distribution of animals, the northwest of Africa belongs to the Mediterranean sub-region, while the rest of the continent forms the Ethiopian region. Africa possesses numerous species of the order *Quadrumana* (apes and monkeys), all of which are peculiar to it. They abound especially in the tropics. The most remarkable are the chimpanzee and the gorilla. The lion is the typical carnivore of Africa. Latterly he has been driven from the coast settlements to the interior, where he still reigns king of the forest. There are three varieties, the Barbary, Senegal and Cape lions. The leopard and panther rank next to the lion among the carnivora. Hyenas of more than one species and jackals are found all over Africa. Elephants in large herds abound in the forests of the tropical regions, and their tusks form a leading article of commerce. These are larger and heavier than those of Asiatic elephants. The elephant is not a domestic animal in Africa as it is in Asia. The rhinoceros is found, like the elephant, in middle and southern Africa. Hippopotami abound in many of the large rivers and the lakes. The zebra and quagga were numerous in central and southern Africa, but the latter is said to be now entirely extinct. Of antelopes, the most numerous and characteristic of the ruminating animals of Africa, at least 50 species are considered peculiar to this continent, of which 23 used to occur in Cape Colony. The giraffe is found in the interior and is exclusively an African animal. Several species of wild buffaloes roam in the interior, and the Asiatic buffalo has been naturalized in the north. The camel, common in the north as a beast of burden, has no doubt been introduced from Asia. The horse and the ass are highly developed in the Barbary States. The cattle of Abyssinia and Bornu have horns of immense size but extremely light. In Barbary and the Cape of Good Hope the sheep are broad-tailed; in Egypt and Nubia they are long-legged and short-tailed. Goats are in some parts more numerous than sheep, especially in the Sudan and in Abyssinia. Dogs are numerous, but cats rare, in Egypt and Barbary. The former in the northern towns serve as scavengers. Bears and foxes are found only in the north. The immense herds of game which formerly abounded in many parts of Africa were diminishing so rapidly that in 1900 measures for their protection were laid down by an international convention, and game reserves have been established in British Africa, Somaliland and elsewhere. The birds of northern Africa are almost identical with those of the south of Europe and the Asiatic countries bordering on the Mediterranean. In the rest of Africa they show more resemblance to those of Australasia. Many of the African birds are famed for the brilliancy of their plumage, such as the sunbirds, bee-eaters, rollers, plantain-eaters, parrots and kingfishers. The ostrich is found nearly all over Africa, but especially in the desert. A remarkable bird of southern Africa is the secretary-bird or serpent-eater, which renders great service to the inhabitants by killing serpents. Another peculiar bird of South Africa is the little honey-guide (q.v.), which points out the nests of bees. The whale-headed stork, remarkable for its enormous beak, may also be mentioned. Owls, falcons, eagles and vultures are numerous. Water-fowl are abundant on the lakes and rivers, and there are many species of quails and partridges. One species of gallinaceous bird, the guinea-fowl, has been domesticated in other countries. Reptiles, owing to the dryness of the climate, are comparatively few. The largest is the crocodile, which abounds in the great rivers and tropical lakes. There are several species of venomous serpents, including the horned viper and the African cobra. The chameleon is common. The rivers and coasts abound with fish of numerous species, and some of them of the most brilliant coloring. Insects are numerous. Among the more troublesome species are the locust, tsetse and white ant.

Inhabitants, Civilization, etc.— There is a marked distinction between the races in the north and east of the great desert and those in central Sudan and the rest of Africa and the south. The main elements of the population of north Africa, including Egypt and Abyssinia, are Hamitic and Semitic, but in the north the Hamite Berbers are mingled with peoples of the same race as those of prehistoric southern Europe and other types of various origins, and in the east and southeast with peoples of the negro type. The Semitic Arabs are found all over the northern region, and even in the western Sahara and central Sudan, and far down the east coast as traders. The Somalis and Gallas are mainly Hamitic. In central Sudan and the whole of the country between the desert and the Gulf of Guinea the population is pure negro — people of the black, flat- or broad-nosed, thick-lipped type, with narrow heads, woolly hair, high cheek-bones and prognathous jaws. Scattered among them are peoples of a probably Hamitic stock. Nearly the whole of the narrow southern section of Africa is inhabited by what are known as the Bantu races, of which the Zulu or Kaffir may be taken as the type. The languages of the Bantu peoples are all of the same structure, even though the physical type vary, some resembling the true negro and others having prominent noses and comparatively thin lips. The Bushmen of southern Africa are of a different type from the Bantu, probably the remains of an aboriginal population, while the Hottentots are apparently a mixture of Bushmen and Kaffirs. Scattered over central Africa, mainly in the forest regions, are pygmy tribes, who are generally supposed to be the remains of an aboriginal population. The bulk of the inhabitants of Madagascar are of Malay affinities. The total population is estimated at about 140,000,000.

As regards religion, a great proportion of the inhabitants are heathens of the lowest type. Mohammedanism possesses a large number of adherents in northern Africa and is rapidly spreading in the Sudan. Christianity prevails chiefly among the Copts of Egypt, the Abyssinians and the natives of Madagascar, the latter having been converted in recent times. Elsewhere the labors of the missionaries have been attended with promising success. It is estimated that about 1 2/5 per cent of the popu-

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MARIBOU STORK (*Leptoptilus crumenifer*) AFRICAN JABIROU (*Mycteria senegalensis*)

lation are Roman Catholics and 1 9/10 per cent Protestants. Over a great part of the continent, notwithstanding European colonization, civilization is at a low ebb, and in the Kongo region cannibalism is still prevalent. Slavery is still practised in many parts and polygamy is widespread. Yet in various regions the natives who have not come in contact with a higher civilization show considerable skill in agriculture and various mechanical arts, as in weaving and metal-working. Among articles exported from Africa are gold and diamonds, palm oil, ivory, wool, ostrich feathers, esparto, cotton, caoutchouc, etc. See paragraph *Commercial Conditions* at end of this article.

Languages.— The languages spoken on the continent may be divided into two great classes, those native to Africa and those brought in from outside; the former including the three great divisions of Negroid, Hottentot-Bushman and Hamitic, the latter Aryan, Malay and Semitic; and the latter again into the pure languages or *patois* of recent immigrants or traders and those which have become naturalized by time and change into virtually native tongues themselves.

The first division of the extra-African tongues comprises: (1) Pure English in South Africa and Liberia, pure French in Algeria and the scattered trading settlements elsewhere. (2) Four "creole" dialects: the Mediterranean "lingua franca" or trade jargon; the English creole or West African Kru-English; the Cape Verde Islands Portuguese creole; and the Boer and Hottentot Dutch creole. The last three are European in stock, but with much African phonic, inflectional and syntactical mixture and influence. The second division includes the Malay or Malagasy of Madagascar and the Semitic tongues of the northeast. These last are (a) Pure Arabic (the Latin of Africa, the universal language of social intercourse and trade wherever Mohammedanism prevails), including the Egyptian, Sudani, Maghreb and Muscat dialects; (b) mixed, as the Abyssinian dialects, derived from the ancient Geez (q.v.), Tigré and Tigriña, Amharic (originally of southern Abyssinia, but now the chief tongue of the country), Harari of the Galla country, Gurague, etc. All these were brought in by Semitic invaders.

The native African stocks are classed in English books mainly according to the system adopted from Friedrich Müller by R. N. Cust in his 'Modern Languages of Africa'; later German Africanists prefer that of Lepsius, the chief difference being on the relations of Bantu and Negro or Nigritic.

1. *Negroid.* This has three main divisions: (a) Bantu, a pure language. This immense group occupies, with enclaves of Hottentot-Bushman and Pygmy, the whole vast triangle from the Kamerun west and Zanzibar east down to the Cape, or pretty much all Africa south of the equator. All its components (for which see BANTU) have one grammar though different vocabularies; the greatest and perhaps purest representatives of it are the Zulus or Kaffirs and their neighbors the Se-chuana. (b) Nigritic, Negro or Sudan-Negro, between the Sahara and the equator. Ethnologically, the races speaking this group of tongues are the purest types of the Negro stock; but linguistically, they are only classed together from the utter impossibility of grouping them with any others, though Lepsius thinks them degenerated Bantu, — a conclusion scouted by others, the affinities being very faint. They are many and to all appearance totally unrelated, so diverse and peculiar are the idioms; some, however, think they show marked characteristics in common. They doubtless represent the oldest races on the continent, wandering in small hostile bands and changing their dialects almost from generation to generation, like all such petty camps with unfixed traditions and no general intercourse; and may well have scores or hundreds of "languages" among them with no traceable connection. (c) The Nuba-Fulah or Ful; sometimes called the Nilotic, from its main seat in the Nile valley from Nubia to the Albert Nyanza, and with isolated tribes farther out, as the Barea and Kunama on the northern border of Abyssinia, and the Masai and Oigob southwest. Others dispute the inclusion of the Fulah, considering it a tongue by itself; perhaps a mongrel, more likely a family as above, which has picked up some Hamitic words. The Dinka, Bari and Shilluk are its chief families along the Nile, the Lur or Shuli and Madi being the last to the south; west of the valley it shades into the Nigritic chaos.

2. *The Hottentot-Bushman.* This is the language of the dwarf tribes, and its relations to others or itself are vigorously debated. Müller thought it represented two ethnological and linguistic divisions. Lepsius thinks it one, Bantu in race and Hamitic in language; but his conclusions are not accepted. Besides the main stock in southern Africa, this group includes the Pygmy dialects in central Africa; it is denied that they have kept their original languages, but this is true of many others, and the ethnological and linguistic problems have no necessary relation.

3. *Hamitic.* This includes (a) the Libyan or Berber dialects spoken across North Africa from the Canaries to Egypt — probably changed scores of times from top to bottom; (b) the ancient Egyptian, with the four dialects of its descendant Coptic (extinct save as the ritual language of the Coptic Church); (c) the non-Semitic or Kushite Abyssinian dialects (formerly called Punic, sometimes Ethiopic, which was more generally applied to Geez); as Bishari (see BISHARIN), the ancient Bedja, between Egypt and Abyssinia; Danakil (q.v.) or Dankali, native name Afar, between Abyssinia, Massowa and Obok; Somali and Galla, in their countries; Agau (through Abyssinia, the users believed to be its aborigines, with dialects as Chamir, Quara, etc.); Saho, between Abyssinia and Adulis Bay; Kaffa, Kullo, etc., in the highlands south of Abyssinia. The Fulah group (see above) and the Haussas in Sokoto have some Hamitic admixture. These Hamite tribes are much mixed, geographically or more intimately, with Semitic and Negro tribes or elements.

"Equatorial" is a name given in 1889 by Müller to a group of Negro tribes south of Darfur, of which he wished to make a new family; the Nyam-Nyam and Monbuttu were the chief. All are of a lighter color than the typical Negro, and their languages are more distinctive still. As above said, it is probable that many such groups can be segregated on the best of grounds.

Systems of Writing.— Africa has four living systems (not counting the fossil Coptic or the European used by those races) and has had four now represented only by inscriptions or papyri. The latter are: (1) Ancient Egyptian, passing from hieroglyphics (a mixture of ideograms and syllables) through the cursive hieratic to the more cursive demotic, the ordinary script of business life. A few of the demotic characters are preserved in the ritual Coptic. (2) Ancient Phœnician, the ancestor of all Western alphabets. (3) Ancient Ethiopian, used for the native tongue around Napata and Meroë. It was cursive and borrowed, but it is not known from whence, nor what language it represents. (4) Ancient Libyan or Numidian, borrowed from southern Arabia and read from the bottom up. There are many inscriptions in it in Algeria and Tunis, some of which have been deciphered; the first was the celebrated bilingual inscription of Takka. The living systems are practically those of the Hamites and Semites, the others being mostly below the grade of civilization which uses such things; and both the former use Semitic systems. The four are:

1. The only one developed in a Negro tribe, and with one exception the only one actually invented and popularly used within historic times: that of the Vei, on the west coast near Cape Mountain, devised about 1834 by Doalu Bukere, a native with a rough knowledge of European printing. It was not an alphabetic system, but a syllabary, with complicated characters like hieroglyphics. It was later used for Mohammedan missionary work, but has been supplanted by the European system, the Christian missionaries refusing to employ it.

2. That of the Touaregs or Saharan Berbers, called *tifinaghen*. It seems to be a descendant of the ancient Libyan, to which it is similar in reading from the bottom up.

3. The Arabic, used by all who wish to write the great language of Mohammedan Africa, the general medium of social and business communication. It is also widely used to write other African languages: by the Berbers and Suahelis for Libyan; by the people of Shoa for Amharic and those of Harar for Harari; by the Malavs of Madagascar and by the Kaffirs.

4. The Amharic, used largely in and around Abyssinia; it is an extension and modification of the ancient Geez or Ethiopic, which therefore we have not classed as dead, any more than the Greek and Roman alphabets can be so called. It is written from left to right like the European languages, the other Semitic systems being the reverse; and the vowels are indicated by modifications of the consonants or marks added to them, making it a semi-syllabic rather than pure alphabetic system. It was borrowed from southern Arabia, and can be traced back to the 4th century on the monuments at Axum, the ancient capital of Abyssinia.

History of Discovery.—Although in Egypt and along the Mediterranean coast (see CARTHAGE and EGYPT) Africa was the seat of remote and comparatively high states of civilization, up to the middle of the 19th century the whole of central Africa was a blank; it is now at least as well known as South America. The civilized nations of the ancient world approached Africa from the Mediterranean and the Red Sea; there is reason to believe that till the introduction of the camel in the 7th century A.D. the desert was an insuperable barrier between the Mediterranean countries and central Sudan.

The name Africa is mythologically associated with Afer, a son of the Libyan Hercules; but this is only an eponym. It is certainly Phœnician, and probably meant "nomadic," a term applied by the Carthaginians to the tribes around. It was the name given by the Romans at first only to a small district of Africa in the immediate neighborhood of Carthage, and nearly corresponding with the Roman province formed on the destruction of Carthage. The Greeks called Africa Libya, and the Romans often used the same name. The first African exploring expedition on record is that mentioned by Herodotus as having been sent by Pharaoh Necho about the end of the 7th century B.C. to circumnavigate the continent. The navigators, who were Phœnicians, were absent three years, and according to report they accomplished their object. The story has been the subject of much controversy, and was for long generally discredited, but recent authorities of weight have pronounced in its favor. The next important voyage recorded is that of Hanno, a Carthaginian, down the west coast, probably 50 or 100 years later. He passed a river with crocodiles and river-horses, and probably reached the coast of Upper Guinea. Herodotus also mentions some young men of the tribe of the Nasamones (living near the Gulf of Sidra) crossing the desert in a westerly direction, and coming to a great river where they saw crocodiles and black men, but it is doubtful if this could have been the Niger. There is no evidence that the Egyptians knew the Nile beyond the site of Khartum, though they may have sent ships as far as the coast of Somaliland by the Red Sea. Nero sent an expedition up the Nile which seems to have penetrated up the White Nile; and remains of Roman origin have been found some distance into the Sahara. From the navigators and traders that frequented the east coast of Africa, Ptolemy may have learned that the Nile issued from two great lakes about the equator. Mohammedanism was carried into North Africa in the 7th century and very rapidly spread to the Atlantic. By the 10th century the Arabs had crossed the desert, and between this and the 14th century Arab travelers visited central Sudan, the Niger and other regions, and till comparatively recently they were the great authorities on much of central Africa.

The first impulse to a more complete exploration of Africa was given by the Portuguese prince known as Henry the Navigator, who in the early part of the 15th century sent out a series of expeditions along the west coast. These were continued after his death, so that in 1486 Bartolomeu Diaz doubled the Cape and in 1497 Vasco de Gama sailed up the east coast as far as Mombasa, and thence to India. Thus for the first time the main outline of the African coast was laid down. Settlements were planted on the east and west coasts by Portuguese, French, English, Dutch and Brandenburgers, but there is no authentic information that any European penetrated into the interior. Maps of the 16th to the 18th century were covered with lakes and rivers, but these were swept away as unauthentic by D'Anville in the middle of the 18th century, and the interior left a blank. An association for the exploration of inner Africa was formed in London in 1788. Additions were

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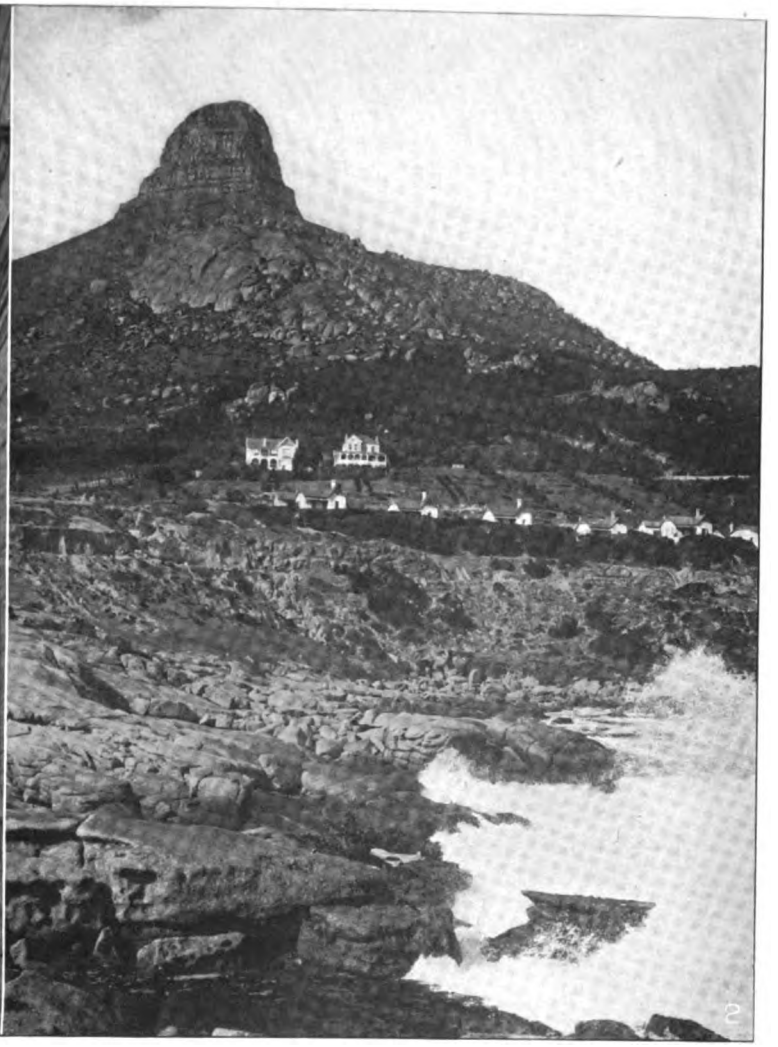
1 Street in Cape Town



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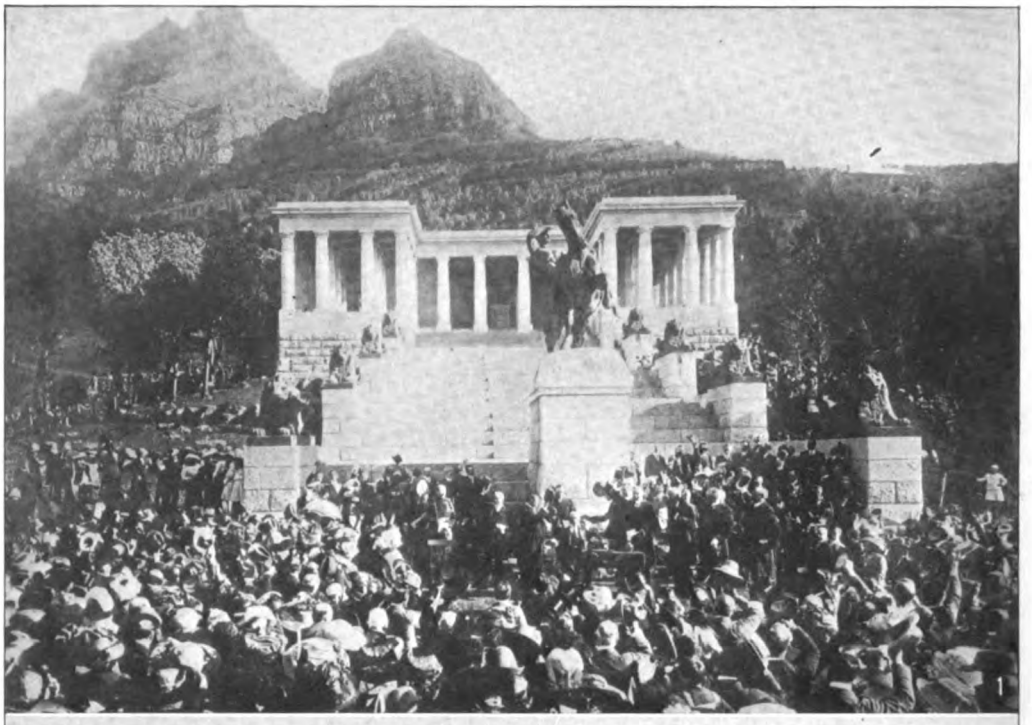
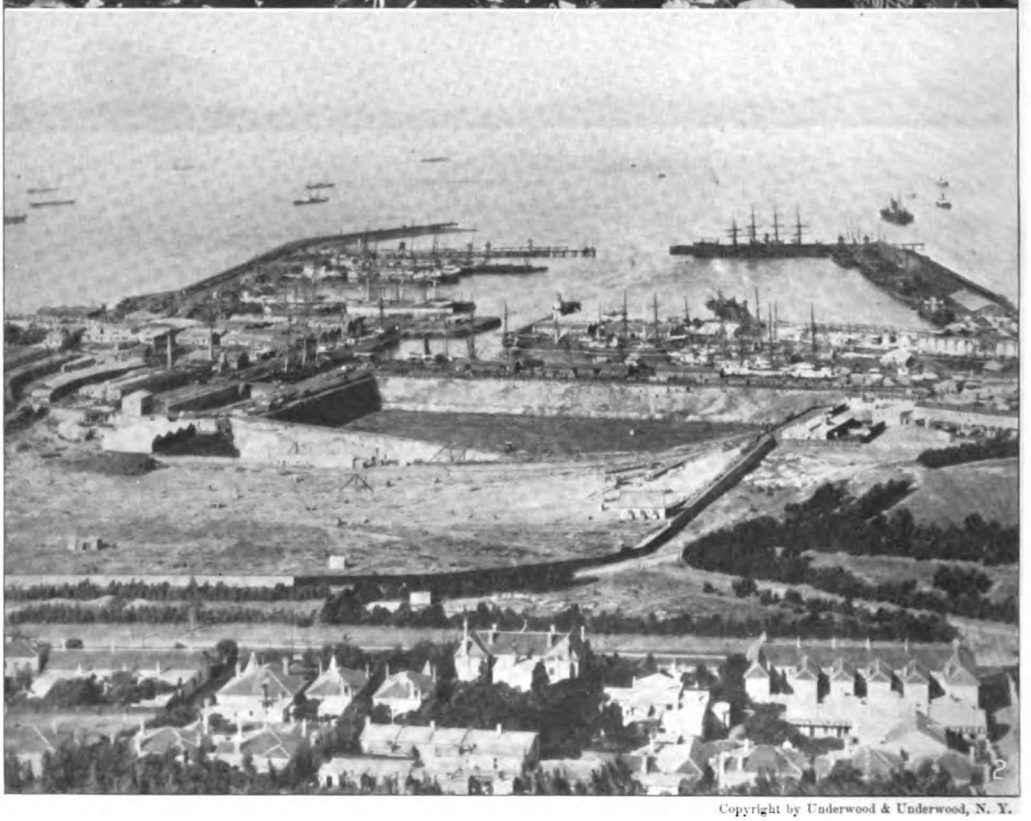
2 The "Lion's Head," part of Table Mountain, Cape Town





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1 Cecil Rhodes Monument, Table Mountain, near Cape Town, South Africa
2 Cape Town Breakwater and Harbor

made to geography under its auspices by Mungo Park, Hornemann, Burckhardt and others.

Modern African exploration may be said to begin with James Bruce, who penetrated through Abyssinia and Sennar to the headwaters of the Blue Nile (1770–72). He was followed by Mungo Park, who reached the upper course of the Niger or Joliba, and whose efforts to explore the river to its mouth cost him his life (1795–1805). Dr. Lacerda, a Portuguese, about the same time reached the capital of Cazembe, west of Lake Bangweolo, where he died. Hornemann, who traveled for the same society as Park, perished in the desert after sending home accounts of Bornu and the neighboring states. In 1802–06 two Portuguese traders crossed the continent from Angola, through Cazembe's dominions, to the Portuguese possessions on the Zambezi.

In 1816 Captain Tuckey, in command of a British expedition, sailed up the Kongo, which he took to be the mouth of the Niger, for 280 miles. About the same time Major Peddie, and after his death Captain Campbell, led a party up the Senegal through the Fula or Fellatah territory, returning to Kakundy on the Nunez. In 1817 Mr. Bowditch explored the country of the Ashantis. In 1818 a French traveler, Gaspard Théodore Mollien, discovered the sources of the Senegal, Gambia and Rio Grande. In 1819 Ritchie and Lyon traveled from Tripoli to Murzuk, and in 1821 Major Laing made some important journeys in the Mandingo district of western Africa. In 1822–24 extensive explorations were made in northern and western Africa by Major Denham, Captain Clapperton and Dr. Oudney, the last of whom died on the way. The travelers proceeded from Tripoli by Murzuk to Lake Tchad. While Denham examined the south and west coasts of the lake, Clapperton proceeded west through Bornu to Sokoto, the capital of the Fellahtah country, on the Sokoto, an affluent of the Niger. Impressed with the importance of establishing political and commercial intercourse with this district, Clapperton organized another expedition for the purpose of reaching Sokoto from the west coast. Setting out from Badagry, on the east of Cape Coast Castle, 7 Dec. 1825, and passing through the kingdom of Yoruba he reached the Niger at Bussa. Here he crossed the river and traversed the kingdom of Nupe to Kano, capital of the Haussa country, which he had previously visited, and from thence proceeded to Sokoto, in the neighborhood of which, after a short residence, he died. His servant, Richard Lander, returned to Kano and attempted to proceed south through the kingdom of Zegzeg, but was compelled by the natives to return to Darroro, from which he reached the coast.

W. Allen, a naval officer, about this time accompanied a mercantile expedition up the Niger, which he surveyed for a certain distance, and in another expedition in 1848 the same officer revised and corrected his survey. Major Laing in 1826 crossed the desert from Tripoli to Timbuktu, but he was killed on his return and his papers lost. René Caillié, after living for some years on the Senegal coast learning the language and initiating himself into the religion and manners of the Arabs, made in 1827–28 a journey to Timbuktu, and thence through the great desert to Morocco. Richard Lander, accompanied by his brother, leaving Badagry for Bussa in March 1830, ascended the river Niger to Yauri, and descending from thence reached the mouth called the Nun in November. In 1832 he traced other mouths of the river up to the main stream; and the identity of the great river which passes under various names in different parts of its course was thus established.

In the south, Livingstone, who was stationed as a missionary at Kolobeng in 1849, passed through the desert of Kalahari, reached the Zuga or Botletle, and after a circuitous route discovered its source in Lake Ngami. In 1851 he went north again, proceeding from the Zuga in a more easterly direction. In lat. 17° 25′ south, and between long. 24° 30′ and 26° 50′ east, he came upon numerous rivers flowing north, which were reported to be affluents of a larger river, the Zambezi.

In 1848 and 1849 Krapf and Rebmann, missionaries stationed near Mombasa, saw the Kilima-Njaro and the Kenia Mountains. In 1851 Francis Galton, starting from Walfisch Bay, made an extensive survey of the Damara and Ovampo countries, in which he found high pastoral and agricultural table-lands. An expedition under the patronage of the British government started from Tripoli in 1850 to visit the Sahara and the regions around Lake Tchad. Richardson, the originator of the expedition, was joined by two Germans, Drs. Overweg and Barth. In crossing the desert from Murzuk to Ghat they found some interesting sculptures. From Ghat to Air they found the country wholly desert and uninhabited. On reaching Lake Tchad Richardson went to Kuka, capital of Bornu, Barth to Kano, Overweg to the native states of Mariadi and Guber. Barth and Overweg met again at Kuka in April 1851, but in the meantinme Richardson had died. Overweg explored the lake and Barth proceeded on another journey south to Massena, in the kingdom of Bagirmi. On his return the death of Overweg left him to prosecute the enterprise alone. He proceeded to Timbuktu via Kano, and after collecting much information about the Niger and its tributaries, over a great part of the course of which he traveled on his return to Kuka, he reached Tripoli in August 1855. Dr. Vogel, who was sent to join Barth, was put to death at Wadai and his papers were lost.

Dr. Livingstone began another journey from Kolobeng on 15 Jan. 1853. After staying a month at Linyante, capital of the Makololo, he proceeded down the Chobe to Sesheke, and thence ascended the Leambye (Zambezi) to the junction of the Liba. After returning to Linyante, and taking with him a party of Makololo, he again set out 11 Nov. 1853, reached the Liba 27 December and proceeded to Lake Dilolo, where he found the watershed of the streams which flow north and south (feeders of the Kongo or the Zambezi) at a level of 4,000 feet above the sea. On his return journey he was confirmed in the belief that an elevated plateau here crosses the country and forms the watershed of the whole continent. He next crossed the Cassabi River, and on 4 April he reached the banks of the Kuango, both these rivers being affluents of the Kongo. Crossing the Kuanga, he reached Loanda on 31 May. On 20 September he set out on his return journey, and following pretty nearly the route by which he had gone, arrived at Linyante. Starting from this

place on 3 Nov. 1855, he reached the Zambezi, and proceeding down the river, and visiting its falls, called by him the Victoria Falls, arrived at Kilimane at its mouth on 20 May 1856, and sailed for England. Thus was accomplished by Dr. Livingstone the remarkable feat of crossing the entire continent from sea to sea — the first time, so far as is known, that this was done by any European. In 1858 Livingstone returned to resume his exploration of the Zambezi regions. Entering the Kongoni mouth of the river in May, he ascended its tributary, the Shire, to Murchison Cataracts, visited Lake Shirwa and Lake Nyassa, traveled on or near the Zambezi to Victoria Falls, established the identity of the Leambye and the Zambezi, sailed up the Shire to Lake Nyassa, also sailed 156 miles up the Rovuma River, and returned to England in 1864.

Between 1856 and 1865 Paul du Chaillu traveled extensively on the west coast, in the neighborhood of the river Ogowe (or Ogobai). In 1861–62 Maj. (afterward Sir) R. F. Burton also traveled on the west coast. He ascended the Kamerun Mountains and confirmed some of the observations of Du Chaillu. A French expedition visited the delta of the Ogowe in 1864. After that the river basin was very fully explored, the principal expeditions being those of Walker, 1866, 1873; Lieutenant Aymes, 1867–68; the Frenchmen Compiègne and Marche, 1872–74; Dr. O. Lenz, 1876; and another French expedition under Savorgnan de Brazza, 1876, who took possession of a large stretch of territory for France. This territory now forms part of French Kongo, which had been traversed by various Frenchmen, including Brazza, Mizon, Le Maistre, Monteil and others.

In 1866 Livingstone entered on his last great series of explorations, the main object of which was to settle the position of the watersheds in the interior of the continent south of the equator, and to discover the source of the Nile. Landing at the mouth of the Rovuma he proceeded southwest round the south end of Lake Nyassa, and then traveling north reached the south end of Lake Tanganyika (discovered by Speke and Burton in 1858). He afterward visited Lakes Mweru and Bangweolo in the basin of the Chambeze, the name given to a headwater of the Kongo. In 1869 he reached Ujiji, on the Tanganyika, and crossed the lake, making extensive journeys in the Manyuema country, and reached the Lualaba or upper Kongo, but could not explore it for want of boats. Henry M. Stanley, who had been specially sent by the proprietor of the New York *Herald* to search for Livingstone, met him at Ujiji on his return from the Manyuema country, relieved his necessities and examined along with him the northern end of Lake Tanganyika. Livingstone afterward started on a fresh journey (in 1872) to determine the course of the Lualaba, intending to travel round the south side of Lake Bangweolo; but after suffering much from illness he died on the shore of this lake on 1 May 1873.

In 1872 the Royal Geographical Society organized two expeditions to go in search of Livingstone. The one, under Lieutenant Grandy, sailed some distance up the Kongo; the other, under Lieutenant Cameron, started from Zanzibar for Tanganyika. On ascertaining the death of Livingstone he proceeded to Lake Tanganyika, where he secured Livingstone's map and sent it to Zanzibar. He ascertained the height of the lake; found an outlet, the Lukuga, on the west side; traversed the Manyuema country; reached Nyangwe, Livingstone's farthest point on the Luabala; proceeded south up the east side of the valley of Lomane to Kilemba in the Urua country; and reached Benguela, on the Atlantic coast, 4 Nov. 1875. The identity of the Kongo and Lualaba was at last settled by Stanley, who, between October 1876 and August 1877, descended from Nyangwe on the latter river to the mouth of the former. After helping to establish the Kongo Free State (1879–85) Stanley proceeded in 1887 with an expedition to relieve Emin Pasha, Gordon's lieutenant, who, after the fall of Khartum, had retreated into the interior. Following the Kongo and its tributary the Aruwimi, Stanley hewed his way through a vast forest, arrived at the Albert Nyanza, met Emin there, returned for his rearguard and stores, and at last brought Emin and his followers to Bagamoyo, on the east coast, in 1889. He also discovered Lake Albert Edward and the lofty mountain of Ruwenzori, on the Semliki, between that lake and Lake Albert. The Portuguese Major Serpa Pinto journeyed from Benguela to Natal in 1878–79; the Germans Wissmann and Pogge crossed from St. Paul de Loanda to Zanzibar in 1881–82; in 1879–80 (after the death of his leader, Keith Johnston), Joseph Thomson crossed from the east coast by the north of Lake Nyassa to the east of Tanganyika and back to Zanzibar; again in 1883–84 he explored the Masai country between the coast and Lake Victoria; Capello and Ivens went from Angola to Mozambique by way of Bangweolo in 1884–85.

One of the most interesting problems connected with African geography was the tracing of the source of the Nile. Among the first of the famous explorers in this direction was James Bruce, who, in 1770, reached the source of the Blue Nile or Bahr-el-Azrek and imagined himself to have solved the great problem. But the real source of the Nile remained long unknown, the great lakes connected with its origin being hardly dreamed of till comparatively recent times. In 1858 Burton and Speke, crossing from Zanzibar, discovered Lake Tanganyika, and the same year Speke also reached the Victoria Nyanza, but did not ascertain that it gave rise to the Nile. Speke and Grant in 1862 reached the place where the Nile leaves the lake and followed part of its course to Karuma Falls. At Gondokoro they met Sir Samuel Baker, who proceeded to investigate the unexplored part, but did not fully succeed in his object. Baker in 1871–73 returned to the scene of his explorations as the commander of an Egyptian force and took possession of the country in the name of the Khedive, but added little to his previous geographical discoveries. He was succeeded in his command by Colonel Gordon, one of whose officers, Colonel Long, more fully traced the Nile between Karuma Falls and the Victoria Lake; while another, M. Gessi, first actually traced the Nile up to its outflow from the Albert Nyanza (1876).

Since 1883 the exploration of Africa has been carried out by a multitude of explorers. In the north the French have pushed south

from Algeria and French explorers, prominent among whom was Marchand during 1896-98, crossed the continent from Loanga, in French Kongo, to Fashoda on the Nile, and Foureau, who, in 1900, crossed the Sahara from Algeria to Lake Tchad, have added greatly to our knowledge of the Sahara. Dr. Junker devoted several years to exploring the country between the basin of the Nile and the Kongo. Mr. Stanley, in his great journey across Africa in 1876, added largely to our knowledge of Lake Victoria and of Uganda, the country between Victoria and Lake Albert. After 1890 the work of the various international commissions, which traced the frontiers of the protectorates of the various European powers, added greatly to the topographical knowledge of Africa. Since the British occupation of Uganda, Colonel Lugard and many other officers have mapped the country between the coast and the lakes, Uganda itself and the country to the west. Italian and British explorers have added to our knowledge of Abyssinia and of the desert between the Nile and the Red Sea. Lakes Rudolf and Stefanie have been discovered and explored by Count Teleki and Lieutenant Von Höhnel from the south, while James, Donaldson Smith, Cavendish, Robecchi, Bottego and others have explored Somaliland and ascertained that the Omo flows into Lake Rudolf. Gregory has investigated Mount Kenia; Meyer has ascended Kilima-Njaro; Baumann and other German explorers have visited the region to the west and south of that mountain, round by the south of Lake Victoria and on to Lake Albert Edward. In 1894 Count Götzen crossed from east to west, discovered Lake Kivu to the south of Lake Albert Edward and a lofty active volcano near its shores, coming out by the Kongo. Many other Germans have been busy in German East Africa, while in British Central Africa Johnston, Sharpe, Joseph Thomson and others have filled in many blanks, and British naval officers have charted Lake Nyassa.

The unique distinction of being the first white man to traverse Africa from south to north on foot fell to the lot of an undergraduate of Cambridge University, Ewart Scott Grogan, who, in February 1898, started from Cape Town with one white companion and a few servants and 18 months later reached Cairo, having traveled the greater part of the distance with only the servants, as his white friend left him before the journey was half done. Mr. Grogan brought back a mass of ethnological information, having carefully investigated and described the various tribes with which he came in contact and cleared up a number of disputed geographical points. Consult 'From Cape to Cairo' (London 1900).

Several German explorers also traversed and mapped Damaraland and Namaqualand; Lugard explored the Uganda region; Gibbons and others traversed the Barotse country. The officials of the Kongo Free State laid open the courses of the numerous rivers that feed the main stream; Hinde found the Lukuga flowing into the Lualaba; Grenfell and others established the connection of the Ubangi or Mobangi tributary on the north with the Makua-Wellé higher up, which had been explored by Junker and others. Under the auspices of the Royal Niger Company, Joseph Thomson and others further explored the Niger; while the Benue and its tributaries and the German sphere in the south were actively explored by British, French and German travelers.

All these three nationalities, moreover, were busy in the vast area between the Guinea coast and the great bend of the Niger. Prominent among them was Binger, who contributed more than any single individual to our knowledge of this region. The French occupation of Timbuktu led to the navigation and exploration of the upper and middle river by gunboats; while a French expedition followed the river from Timbuktu to its mouth. Monteil crossed from Senegal to Lake Tchad and traversed the desert to Tripoli, and the Lake Tchad region was further explored by Lenfant and Loeffler (1902-04) and Alexander and Gosling (1904-05). French expeditions crossed from the Kongo to the Nile and all the river systems are now mapped in their main features. It may indeed be said that the pioneer exploration of Africa has been completed, and by 1910 good economic maps existed of all the colonies. What remains to be done is the filling up of the meshes between the vast network of explorers' routes, and this is a task which cannot be completed for many years.

International and Diplomatic Relations. — Early in the history of the United States American shipping trade in the Mediterranean suffered in common with the rest of commercial navigation from the piracies of the Barbary States. In 1784 Congress sought to safeguard American commerce by the negotiation of treaties. In 1787, Thomas Barclay signed a favorable treaty with the Emperor of Morocco for a period of 50 years, giving the United States the most-favored nation privileges, with consular representation. The treaty of 1797 with Tunis, like that of Morocco, was also favorable, and, with modifications in 1827, remained effective after the French occupation in 1881.

The treaties negotiated with Algiers in 1795 and with Tripoli in 1796 proved unreliable and expensive. Failing in their obligations, the American naval blockade of Tripoli in 1805, and of Algiers in 1815, led to new treaties of peace and friendship. By compulsion and an expenditure of nearly $3,000,000 the United States gained the commercial freedom of the Barbary shores for the world. See Barbary Powers, U. S. Treaties and Wars with the.

While the slave trade early in the 19th century was a subject of international discussion, and its suppression was advocated in the Treaty of Ghent in 1814, it was not until 1842 that the United States joined with Great Britain in a patrol of the west coast of Africa, which ended with the abolition of slavery in America in 1863.

In 1886 the Sultan of Zanzibar confirmed the extra-territorial rights granted Americans under a treaty made with the Sultan of Muscat in 1833, which lasted until the British occupation and the Anglo-American convention of 1905.

In 1903 a most-favored nation commercial treaty was effected by the United States' representative with Abyssinia.

The United States had shared in the most-favored nation treaty arranged in relation to

Moroccan affairs by the Madrid conference of 1880, and at the Algeciras conference in 1906, precipitated by German intervention, its representatives signed the treaty "without assuming obligation or responsibility for its enforcement," the Senate ratifying "without purpose to depart from the traditional American foreign policy." See AMERICAN DIPLOMACY; TREATIES; UNITED STATES — DIPLOMACY OF THE.

Modern History — International Intervention and Colonization.— Before 1875 the only European powers with considerable interest in Africa were Great Britain, France and Portugal, the first being predominant. After the Franco-Prussian war (1870–71) the unified German nation desired to build up a colonial empire, France also sought compensation for her loss of European prestige by colonial expansion, while Italy, recently become a united kingdom, likewise desired colonies. South America being protected by the Monroe Doctrine, Africa was the only field open to these conflicting ambitions. Great Britain and Portugal, seeing their influence threatened, determined to guard and if possible extend their possessions. Matters were brought to a head by Leopold II, King of Belgium, who conceived the project of forming a great state in the recently discovered Kongo territory in central Africa. On his initiative the "International African Association" was founded in 1876, with headquarters at Brussels, ostensibly to place the exploration and commercial development of Africa on an international footing. This "association" finally resulted in the Berlin Conference of 1884, by which the Kongo Free State was established under the sovereignty of the Belgian King, and the general spheres of influence of the other Great Powers were defined. Meantime Germany had established a footing in East Africa and Italy on the Red Sea, France had secured her conquest of Algeria and established a protectorate over Tunisia, and Great Britain had consolidated her influence in South Africa. The possessions of the powers were added to and the boundaries more or less definitely fixed in subsequent agreements, the most important of which are those of 1 July 1890 between Germany and England; of 5 Aug. 1890 between France and England; of 11 June 1891 between Portugal and England; of 24 March and 15 April 1891 between England and Italy, and of 15 March 1894 between France and Germany. As a result of the Fashoda incident in 1898, England secured control of the Upper Nile valley; by the Boer war (1899–1902) she gained possession of the South African Republic and Orange River Free State, which in 1910 were united with Natal and Cape of Good Hope Colony under the name of Union of South Africa, while by the conventions of 1899 and 1904 she strengthened her already dominant position in Egypt. The latter, however, remained nominally under Turkish control until 18 Dec. 1914, when a British protectorate was declared. Belgium annexed the Kongo Free State in 1907–08; Italy annexed Tripoli 1911–12, and France declared a protectorate over Morocco 1912. In 1915 territory under British control in Africa included: North and South Nigeria and protectorate, Gold Coast and protectorate, Sierra Leone and protectorate, Gambia and protectorate in West Africa; Mauritius and dependencies; Seychelles Islands, Somaliland, East African protectorate, Uganda protectorate, the islands of Zanzibar and Pemba in East Africa; Nyasaland, Union of South Africa, Rhodesia, Swaziland, Basutoland and Bechuanaland in South Africa; Egypt and Anglo-Egyptian Sudan; the islands of Ascencion and Saint Helena; in all an area of 3,514,271 square miles, with a population of 52,311,544. Territory under French control included: Algeria and Algerian Sahara, Tunisia, Morocco, French Kongo, Madagascar, Mayotte and the Comoro Islands, Reunion Island, French Somaliland and French West Africa in which are comprised Senegal, French Guinea, Ivory Coast, Dahomey, Upper Senegal and Niger Territories and Mauretania; in all an area of 4,403,401 square miles (including Morocco), with a population of 30,681,243. Territory under German control before the European war included: Togo, Kamerun, German Southwest Africa, German East Africa; in all an area of 931,460 square miles, with a population of 14,890,000. German Southwest Africa was conquered by Great Britain 1915, Togo in 1914, Kamerun 1915. Territory under Portuguese control included: Cape Verde Islands (1912), Guinea, Principe and Saint Thomas Islands, Angola, Mozambique; in all an area of 793,980 square miles, with a population of 8,245,032. Territory under Italian control included: Eritrea, Italian Somaliland, Tripoli and Cyrenaica; in all an area of 591,230 square miles, with a population of 1,378,176. Territory under Spanish control included: Rio de Oro and Adrar, Spanish Guinea and islands of Fernando Po, Annabon, Corisco, Great Elobey and Little Elobey; in all an area of 84,814 square miles and a population of 235,844. The Belgian Kongo has an area of 909,654 square miles, with a population of 15,000,000. Liberia (area 40,000 square miles, population 1,500,000–2,100,000) being under the supervision of the United States as regards finances, military organization, etc., Abyssinia (area 350,000 square miles, population about 8,000,000) is the only independent nation remaining in Africa. For further details see separate countries mentioned.

Commercial Conditions.— Necessarily in so large an area with so many tribes and peoples who keep no accounts of their transactions, a considerable amount of commerce must pass without being recorded in any way, yet the annual commerce of Africa, of which statistics are available, amounts to over $1,440,000,000. The principal imports were distributed as follows: Into British territory (1913–14), $441,516,990; French territory (1913), $174,250,765; Portuguese territory (1913), $74,000,000; German territory (1912), $30,000,000; into the Kongo Free State (1912), $11,000,000; and into Italian territory (1912), $10,500,000. They consist largely of manufactured goods, especially cotton goods. Of the exports a large share, especially those from the south, is gold and diamonds; in the tropical region ivory, rubber, palm nuts and gums and in the north a fair share of the exports are products of agriculture, cotton, coffee, cacao, spices, dates, etc. Exports from British Africa amounted (1914) to over $489,000,000; from French Africa (1913) to $128,000,000; from Portuguese Africa to $42,000,000; from German Africa (1912) to $25,000,000; from Belgian Kongo (1912) to $12,000,000.

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Railroad development in Africa has been rapid in the past few years and seems but the beginning of a great system which must contribute to the rapid development, civilization and enlightenment of the "Dark Continent." Already the proposed "Cape to Cairo" railroad runs north from Cape Colony to Elizabethville in Katanga, Belgian Kongo, about 2,300 miles, and south from Cairo to Sennar in the Anglo-Egyptian Sudan with branches to Port Sudan on the Red Sea and to El Obeid, the capital of Kordofan. At the north numerous lines skirt the Mediterranean coast, especially in the French territory of Algeria and in Tunis, aggregating about 3,134 miles; while the Egyptian railroads are, including those of the Sudan, 3,779 miles in length. Those of the Union of South Africa are 8,833 miles and of Rhodesia 2,481 miles in length, and those of Portuguese East Africa are another 1,000 miles in length. In British West Africa there are about 1,500 miles open; in the Belgian Kongo about 1,000 miles, while in German Africa, before the European war, there were over 1,700 miles in operation. The Great Lakes Railway in the Belgian Kongo (total length 165 miles) was completed in 1915 and links the Upper Kongo with the German railway from Ujiji to Dar-es-Salaam on the Indian Ocean. The Upper and Middle Niger are connected at three points with the Atlantic Ocean.

Including all of the railroads now constructed or under actual construction, the total length of African railways is about 22,900 miles. A large proportion of the railways thus far constructed are owned by the several colonies or states which they traverse, about 279 miles of that of Egypt and nearly all of the Union of South Africa and Rhodesia systems belonging to the state.

That the gold and diamond mines of South Africa have been and are still wonderfully profitable is beyond question. The Kimberley diamond mines, about 600 miles from Cape Town, now supply 98 per cent of the diamonds of commerce, though their existence was unknown prior to 1867 and the mines have thus been in operation scarcely 50 years. It is estimated that over $900,000,000 worth of diamonds have been produced in South Africa up to the end of 1913, the output in that year alone having been valued at over $56,500,000, and this enormous production would have been greatly increased but for the fact that the owners of the various mines there formed an agreement to limit the output so as not to greatly exceed the world's annual consumption.

Equally wonderful and promising are the great Witwatersrand gold fields of South Africa, better known as the Johannesburg mines. Gold was discovered there in 1883 and in 1884 the value of the gold product was about $50,000. It increased with startling rapidity, the product of 1888 being about $5,000,000; that of 1890, $10,000,000; 1892, over $20,000,000; 1895, over $40,000,000; and 1897 and 1898, about $55,000,000. In 1914 the gold output from the Union of South Africa was valued at over $178,300,000 and that of Rhodesia at over $17,900,000, and it seems probable that South Africa will for many years continue to be, as it is now, the largest gold-producing field of the world. Agriculture and farming have also made considerable progress in many parts of Africa, white immigration has steadily increased, as has the trade between the colonies and their mother countries. Plans for industrial training of the natives have been devised by the colonial governments, and the slave-trade, which has been a canker in the growth of Africa since the end of the 17th century, though still prevalent in many parts, has been checked to a certain degree by the extension of European control and improved economic conditions.

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CHARLES LEONARD-STUART,
Editorial Staff of The Americana.

AFRICA, Colonization and Intervention in.— It is difficult to summarize the origin and development of the larger recent colonial expansion movements of European nations seeking territory and economic concessions in Africa, the efforts to secure strategic positions, the persistent work in the conquest of natural obstacles, the penetration of the wilds to stop slave-hunting and the slave trade and to establish peace and security, the enterprises and blunderings which furnish lessons of statecraft, and the evolution of adjustments in administration based on scientific study of peoples and conditions. These movements forming a part of world politics chiefly relate to the founding of the Kongo Independent State and its transition to the Belgian Kongo, German colonization in Southwest Africa, British and German East Africa (and Uganda), French colonial expansion in West Africa (and the Sudan and Sahara), Nigerian enterprise, South African expansion and union, and the reoccupation of northern Africa (Algeria, Tunisia, Morocco, Tripolitania, Egypt and the Sudan). They represent various phases of a vast world movement which none of the great European Powers had seriously considered in 1870 when their African possessions were still confined to seaport towns and adjacent territory — which were regarded as mere trade centres and not as bases for colonial expansion. Although French colonial enterprises in Africa began in 1636 and were extended and consolidated between 1854 and 1865, France really did not conceive dreams of a great Mediterranean-Kongo colonial empire until the early eighties when the Senegal colonists reached the Niger. She evolved a more progressive policy after the acquisition of Tunis. England, with the spirit of conservatism, and without any preconceived policy of expansion, was led to extension of territory by unexpected developments. In 1884, although forced by circumstances of 1882 to interfere in Egypt, she was still undecided on a policy of colonial expansion until forced to act by new conditions. Under Gladstone's leadership she would never have consented to turn Egypt into a British protectorate. Until 1884, she had been in no haste to enter upon a race for territory in West Africa, but, under pressure of French and German activities, she realized the necessity of formulating a definite policy of expansion there, and in June 1885 to protect British interests on the Niger she proclaimed a British protectorate over the region — the beginning of a policy which by 1914 resulted in the amalgamation of all Nigeria into a single united protectorate. Her period of indecision and uncertainty was not fully ended until about 1885 after the fall of the Gladstone ministry. Although Germany was under strong pressure after 1878 to enter the field of international politics, Bismarck postponed action until he had firmly secured the position of Germany in Europe through a tariff program and by the formation of the triple alliance of 1882. Alarmed at conditions resulting from the industrial revolution and increase of population at home, and partly influenced by the delay of the British government to establish a protectorate over Atlantic coast territory (north of Cape Colony) in which German missions had been established, Bismarck in 1884 determined upon colonization. In 1884, he sent a war ship to take possession of territory in Southwest Africa in which England promptly recognized German rights; and in 1885 he officially proclaimed in East Africa a German protectorate which, through the influence of England, was recognized by the Sultan of Zanzibar. Aroused by the entrance of Germany into Southwest Africa and the expansion of the Boers westward, England took under her protection Basutoland in 1884 and Bechuanaland in 1885 — the latter in order to keep the way open to the north of the native districts of Matabeleland and Mashonaland whose possibilities attracted the attention of Cecil Rhodes (and John Hays Hammond) by 1888. The later attempt (after 1890) of Germany to secure the Uganda region by treaties with the natives was frustrated by the prompt action of the British East African Company which, from 1890 to 1892, obtained a control which made permanent the British protectorate in East Africa and won the key to the Nile. By the new treaties (after 1895) the British government secured the Nile as the frontier of Uganda and proceeded to safeguard her interests in that region by a railroad which was begun in 1895 and which reached Lake Victoria at the close of 1901.

In South Africa also, forced by new factors which changed completely the situation, the British government after 1884 adopted a policy of forward movement. After the circumstances by which England was led to intervene in Egypt in 1882, and to undertake the reorganization of the Egyptian government after 1883, the British scheme of European extra-legal advisers acting with a gov-

ernment of native Egyptian officials worked admirably, securing a slow but steady progress of reform and affording the people every chance to learn the elements of national self-government. The Gladstone government was justly criticized for failing properly to support General Gordon with force sufficient to conduct an orderly and successful retreat in 1884. The tragedy of 1884 temporarily shattered the confidence of the Egyptians in the integrity and ability of the British government and multiplied the dangers and difficulties of the later reoccupation of the Sudan —an event which was finally accomplished by Kitchener in 1898. Considering the prospective economic benefits of European colonies in Africa, the possessions controlled by France and England are the most fertile and promising; those of Spain and Italy are of questionable value; while some parts of those controlled by Germany and Belgium and Portugal are promising. Although, as a financial proposition, Algeria does not pay, its future possibilities are excellent; and its position is assured since the definite and final settlement of the frontier question in 1911 by the acquisition of Morocco to which France is now applying the general principles of her Tunisian system of administration. Although Italy, adopting French methods in the preservation of local customs, has made a good beginning in orderly government in Turkish-ridden Tripoli, she will find a long and painful process necessary to secure a self-supporting and prosperous colony. British East Africa promises soon to become self-sustaining. The three German protectorates, recently lost in the World War, have never been satisfactory, although the most constant irritation which existed between settlers and natives was greatly lessened in 1907 under the leadership of Dernberg who inaugurated more scientific methods of government. In the German East African protectorate, on which the German government has spent large sums, no remarkable progress has been achieved either in colonization or in development of the region.

JAMES M. CALLAHAN,
Professor of Political Science, University of West Virginia.

AFRICAINE, L' (Die Afrikanerin), an opera in five acts by Jacob Meyerbeer (1791–1864); text by E. Scribe; first performed at Paris 28 April 1865 and in New York 1 Dec. 1865. The plot revolves around Vasco da Gama, the famous Portuguese navigator (b. 1469), who is betrothed to Donna Inez, daughter of Admiral Diego. While da Gama is away with Diaz on a voyage of discovery by way of the Cape, a rumor reaches Lisbon that he has been shipwrecked and lost at sea. Her father insists that Donna Inez shall marry Don Pedro, a councillor of the king. In the first scene, which is laid in Lisbon, the council of state is sitting when da Gama suddenly appears before them and describes his adventures as the sole survivor from the wreck. He produces maps to show that other undiscovered lands lie beyond Africa. On his way home he had picked up a man and a woman of some unknown race who refuse to give the name of their country. For his temerity in assuming the existence of countries not mentioned in Holy Writ, da Gama is thrown into prison, together with the two mysterious natives, Nelusco and Selika. For having rescued her from a slave ship, Selika has fallen in love with da Gama. Her passion is not returned. Her companion, Nelusco, is jealous and attempts to stab da Gama in the cell while asleep, but Selika frustrates his design by awakening da Gama in time. She finally points out her country on the map, for which the navigator vows eternal gratitude. Then Inez enters the cell and announces that da Gama is free; she has purchased his liberty by marrying Don Pedro, having been told that da Gama was enamored of the dusky queen, Selika. Denying infidelity on his part, da Gama immediately makes Inez a present of the two slaves. Don Pedro had meanwhile gained possession of da Gama's maps and plans and been commissioned by the government to undertake the voyage of discovery. He decides to take the two natives with him. The third act plays on board of Don Pedro's vessel in the Indian Ocean. He is accompanied by his wife, Inez, and the native, Nelusco, is steering the ship—a somewhat broad stretch of imagination. Don Pedro is warned by his friend Don Alvar, also a member of the council, that Nelusco means treason, but the warning is unheeded, although two ships of the expedition were already lost. On board of a small sailing ship Vasco da Gama is following them. He overtakes them and, fearing only for the safety of Inez, he adds his warning to that of Don Alvar. But Don Pedro orders him to be shot; Inez pleads for his life; suddenly a storm breaks out and the vessel strikes upon a rock close to a cannibal island—Madagascar. A horde of savages overwhelm the ship and rescue their queen, Selika, whose influence alone saves the Christians from being massacred. In the fourth act Selika is restored to her position as queen. Her priests clamor for the white men's blood as a sacrifice to the gods; the white women are to inhale the deadly manzanillo-tree. Desiring to save Vasco from death, Selika proclaims that he is her husband, and Nelusco is prevailed on to vouch for the statement. The marriage rites are about to be performed. Believing Inez to be already dead, da Gama is soon reconciled and once again swears eternal fidelity to Selika. But, hearing the voice of Inez, who is being led to death, he turns pale and betrays that he still loves her. In the final scene Selika determines that Inez shall die. In an interview, however, her jealousy fades away, and she orders that Inez and Vasco be placed on a ship to return home. As the departing vessel sinks on the horizon Selika herself inhales the deadly perfume of the manzanillo-tree and dies. An invisible chorus consoles her with the assurance that all are equal in love's eternal realms.

AFRICAN INTERNATIONAL ASSOCIATION. King Leopold of Belgium called a conference of geographers and explorers at Brussels in 1876 to consider the development of Africa. This was the first definite step in the modern partition of the continent. King Leopold summoned representatives of Great Britain, Austria-Hungary, France, Belgium, Germany, Italy and Russia "to deliberate on the best methods to be adopted for the

exploration and civilization of Africa and the opening up of the interior of the continent to commerce and industry." After deliberations lasting three days the conference formed the "International African Association," with its headquarters at Brussels; committees were to be established in the various countries represented and the central idea was apparently to place the entire matter of the exploration and development of Africa on an international footing. The greed of the different nations, awakened by the commercial prospects of the Kongo, led to various disputes, and at length it was decided by consent of all the Great Powers, including the United States, to adjust the several difficulties at an international conference in Berlin. This conference opened 17 Nov. 1884 and closed its session 26 Feb. 1885. Prince Bismarck presided at its deliberations. Fifteen countries were represented. It was declared that the regions forming the basin of the Kongo River and tributaries shall be neutral territory, free trade shall exist there, nationals of any country may undertake transportation therein, the powers exercising sovereign rights in adjacent territory shall not exercise any monopoly of trade and all shall bind themselves to suppress slavery. The central association became gradually more and more Belgian in character, while the territory in question at last developed into the Kongo Free State under the personal sovereignty of King Leopold. See AFRICA; BELGIAN KONGO; STANLEY, H. M.

AFRICAN METHODIST EPISCOPAL CHURCH, The. Work among the negroes was begun by the Methodist Episcopal Church at an early date. Bishop Asbury was much interested in the race and often preached to them. "Black Harry," a noted colored preacher, often accompanied Bishops Asbury and Coke and preached to white congregations as well as congregations composed almost entirely of black men. For a considerable number of years the two races worshipped together, but gradually they separated. As early as 1787 a society was organized among the negroes in Philadelphia as the result of ill-treatment received. The formation of the society was opposed by the whites. In 1793 Richard Allen erected a church on his own lot and at his own expense. This brought the church into controversy with the authorities. The whole involved story is given in the historical preface to 'The Doctrines and Discipline of the A. M. E. Church,' the last edition of which appeared in 1916. Dr. Benjamin Rush, the noted physician, sympathized with them and helped them. Bishop William White, bishop of the Protestant Episcopal Church, was appealed to and ordained Rev. Absolom Jones, one of their number, to be their pastor. However, when the new meetinghouse was completed it was dedicated by Bishop Asbury and was named Bethel. The subsequent history of the church was one of persecution and litigation. The members of Bethel were victorious in the suit brought against them.

A similar time of trial and persecution was experienced by the colored people of Baltimore and other places. The feeling produced made a division necessary. In 1816 a general convention was called to meet in April in the city of Philadelphia. Seventeen delegates responded to the call, representing congregations in Philadelphia, Baltimore, Attleborough, Pa., and Salem, N. J. At this convention it was resolved: "That the people of Philadelphia, Baltimore and all other places who should unite with them, should become one body under the name and style of the African Methodist Episcopal Church." Articles of incorporation were not filed until May 1900. The trustees are 12 and consist of four bishops, four ministers and four laymen. Rev. Richard Allen, who 17 years previously had been ordained deacon by Bishop Asbury, was elected bishop and served in that capacity until his death, 26 March 1831. He was not, however, the first choice of the convention. Rev. Daniel Coker was first elected, but resigned the next day. On 11 April 1816 Mr. Allen was ordained bishop by Rev. Absolom Jones, mentioned above. The convention adopted the Book of Discipline of the Methodist Episcopal Church, rejecting, however, the articles relating to the office of presiding eldership. Later they adopted this officer in their polity and he remains as one of their executives to this day. They also used the hymnal of the Methodist Episcopal Church until 1826, when they prepared one of their own.

At the time of the convention about 3,000 members were numbered as belonging to the various churches represented. The growth of the new church was very rapid. The church spread south and southwest in its growth. As early as 1822 there was a strong church of 3,000 members in Charleston, S. C. It was suppressed by the authorities as dangerous to the community interests. Probably some of the leaders had been too outspoken to please the white authorities and at that time it was the only church organization in the South not under white leadership. After the Civil War ceased the membership of the denomination greatly increased. As early as 1866 there were 10 annual conferences, 185 pastors, 206 churches and 50,000 members. There are now, according to the latest statistics available, 81 conferences, including a conference in Bermuda, one in Nova Scotia, one in Ontario, seven in Africa, one in the West Indies and one in South America; 5,000 preachers, 6,000 churches and over 650,000 members.

In 1856 the members of the African Methodist Episcopal Church residing in Canada formed the British Methodist Episcopal Church and elected Willis Nazrey, then bishop of the A. M. E. Church, as their bishop. In 1884 the church was reunited and the British M. E. Church ceased to exist except in a very small minority.

The General Conference is the supreme governing body and, as in other Methodist bodies, it has only legislative power for the church. It is composed of all the bishops, General Conference officers, college and university presidents and deans of theological schools, two ministerial and two lay delegates from each annual conference. If a conference has more than 60 members it is entitled to an additional ministerial delegate for each 30 members or fraction of the same exceeding 15. The Annual Conference is composed of all the traveling elders, deacons and licentiates and

all the local elders and local deacons and two laymen from each district in the bounds of the conference. Members of other conferences visiting the session of the conference have the right to speak in debate but cannot vote.

The District Conference is composed of all traveling ministers, local preachers and one steward from each quarterly conference in a presiding elder's district. The District Conference does considerable work done by the Annual Conferences in other churches, such as the preliminary examination of candidates for admission to the ministry.

The Quarterly Conference is the governing body of the local church. The women of the church have a large share in the local government. There are not only stewards but stewardesses as well. From three to nine belong to each local Quarterly Conference. The church also makes use of the services of deaconesses. The bishops, however, are specifically prohibited from ordaining women to the ministry.

The present Board of Bishops consists of 16 members, 15 of whom are in active service. The church is divided into 15 episcopal districts over each of which a bishop presides for a period of four or more years, as the General Conference shall direct. The limit of service of presiding elder or pastor is five years.

The educational work of the church includes 20 institutions of which 10 are of collegiate grade, two are normal schools and one an industrial school. For the training of their ministry they have two theological seminaries: Payne Theological Seminary, located at Wilberforce, Ohio, and connected with Wilberforce University; and Turner Theological Seminary, connected with Morris Brown College, Atlanta, Ga.

The Missionary Society was organized by the General Conference of 1844 and includes both foreign and home missions in its work. Previous to that date, however, the church had conducted mission work in Hayti, sending Scipio Beans as missionary in 1827. In 1830 mission work was begun in Santo Domingo. In 1820 missions were established in Sierra Leone by Rev. Daniel Coker. In 1878 work was begun in Liberia and in 1889 in the Transvaal. In 1908 and 1912 Bishop Heard was sent to Africa as resident bishop. In 1912 Bishop Johnston was resident bishop of South Africa. In 1916 Bishop Ross succeeded Bishop Heard, while Bishop Beckett succeeded Bishop Johnston. The headquarters of the Missionary Society is located in New York.

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SAMUEL G. AYRES.

AFRICAN SLAVE TRADE. See NEGRO, THE.

AFRICAN WAR, The, in Roman history, Cæsar's campaign against the Pompeians who after Pharsalia kept up the war in Africa, and were crushed at Thapsus, 46 B.C. The history of it printed as Cæsar's is not his, and the author is unknown.

AFRICANUS, Sextus Julius, Christian historian of the 3d century: b. in Libya, traveled in Asia Minor, and from 195 to 240 lived at Emmaus near Jerusalem. No copy exists of his 'History of the World' in five books from the Creation to A.D. 211, a period which he computed at 5,723 years, but it is known by considerable extracts made by Eusebius for his 'Chronicon,' and by Syncellus and Cedrenis. A letter to Origen on the book of Susanna and Origen's reply exist. Consult Geizler, H., 'Sextus Julius Africanus und die Byzant. Chronographie' (2 vols., Leipzig 1880–85).

AFRIDIS, af-rē'dēz, a tribe of Afghans or Pathans on the northwest Indian border near the Khyber Pass, who after many years of the customary border raids were dignified into almost a great power by the ill-advised policy of the Indian government in sending out an imposing army against them in place of the usual small punitive expeditions. The tribe sent their women into the English camp to be cared for and protected, fought for some months in their mountains till the planting season was come, then submitted and promised an indemnity, having enjoyed the highest glory and felicity their natures could appreciate.

AFRIKANDER ("Taal" Dutch for African), a native South African; commonly used for the Dutch stock alone.

AFRIKANDER BOND, or BUND, bŭnt, an association of white natives of South Africa to make native influence paramount there and ultimately secure its independence; formed in 1879, but thus named in 1880. The Cape Colony wing supported Cecil Rhodes till after the Jameson Raid in 1895, which it considered as fostered by him with objects exactly contrary to its own. It carried the elections in 1898, and while advising Kruger to grant concessions to the Outlanders for safety's sake, its sympathies were hostile to them; in the ensuing war it was a heavy handicap to the English, seeming likely at one time to add Cape Colony to the revolt; indeed, it held a convention, 6 Dec. 1900, at Worcester, C. C., condemning the war and English policy, insisting on the recognition of the South African Republic, and censuring the policy of the high commissioner. The success of the British and the annexation of the territory to the empire of Great Britain brought about a dissolution of the organization.

AFTER-DAMP, the gaseous product formed by an explosion of fire-damp (q.v.) in a coal mine. It consists largely of nitrogen from the air, and carbon dioxide formed by the explosive combustion of the hydrocarbon gas given off by the coal. It seldom contains sufficient free oxygen to support respiration. Hence its danger to the miners.

AFTERGLOW, a display of brilliant colors in the western sky after sunset. The colors are usually various shades of red, al-

though yellows and grays are sometimes visible. Afterglows follow volcanic eruptions of explosive character and are generally ascribed to the presence of minute dust particles in the air. The eruption of Krakatoa in 1883 was accompanied by most gorgeous afterglows which were observed throughout the world and persisted for several years. Similar effects were seen over a much smaller area after the outbursts of Mont Pelée and La Soufrière in May 1902. The name foreglow is given to such displays in the eastern sky before sunrise.

AFTER-IMAGE, AFTER-SENSATION and **AFTER-PERCEPT** are the terms used to denote the direct after-effects of the stimulation of a sense organ. These after-effects occur in almost all of the sense departments. A brief stimulation of the sense organ gives a primary sensation, then a pause of a fraction of a second, followed by a secondary sensation of the same quality as the primary sensation. After-images of touch follow after brief contact. They do not appear under ordinary circumstances, but may be observed if special conditions are produced; for example, a gentle tap of a point of a needle will be followed by a pause, then an after-sensation which differs from the primary sensation in that it seems to be produced from within the body, not from without. The effects of a temperature stimulus may persist for a time in the same quality as the primary sensation. After-taste and after-smell have been observed, but have not been studied. Auditory after-sensations, analogous to after-sensations of touch, are very weak and of brief duration.

After-images of vision are stronger and more permanent, consequently have been given much more attention by experimentalists. It has been found that after the retina has been stimulated by light for one second, or less, the primary image disappears quickly; an interval of less than two seconds is then followed by a positive after-image, that is, an after-image of the same quality as the primary image.

A stimulus of longer duration is followed immediately by the positive after-image, and this image may itself be followed by a negative after-image, that is, an image which differs very much in brightness from the primary image, or is of a different color. With some observers a brief stimulus is followed immediately by a negative after-image, which fades away quickly to be followed after an interval by a more permanent positive after-image. Several images may succeed each other immediately or be separated by an interval of time. A stimulus of still greater duration is followed directly by a negative after-image. In such cases the after-image is usually of a color that is complementary to the color of the primary image, especially if observed with closed eyes or if projected upon — that is, seen while looking at — a gray background. The duration of the after-image varies with the intensity, duration and area of the stimulus. The results of experiments, under conditions such that the intensity of the light does not vary, have not as yet shown that any one color has more power to produce after-images than any other color. The greater the angular distance of the portion of the retina stimulated, from the fovea, the less distinct and the less durable is the after-image. There seems to be no after-image at an angular distance of 45 degrees or more from the fovea. The explanation for this fact may be physiological, or psychological, or both; that is, it may be due to the fact that the periphery of the retina is more easily fatigued than the fovea, or it may be due to lack of ability to attend to those portions of the retina which are not customarily attended to. When an object occupies the attention, the eye is so directed toward it that the image falls over the fovea; the mind does not ordinarily attend to images that are not over or very near the fovea.

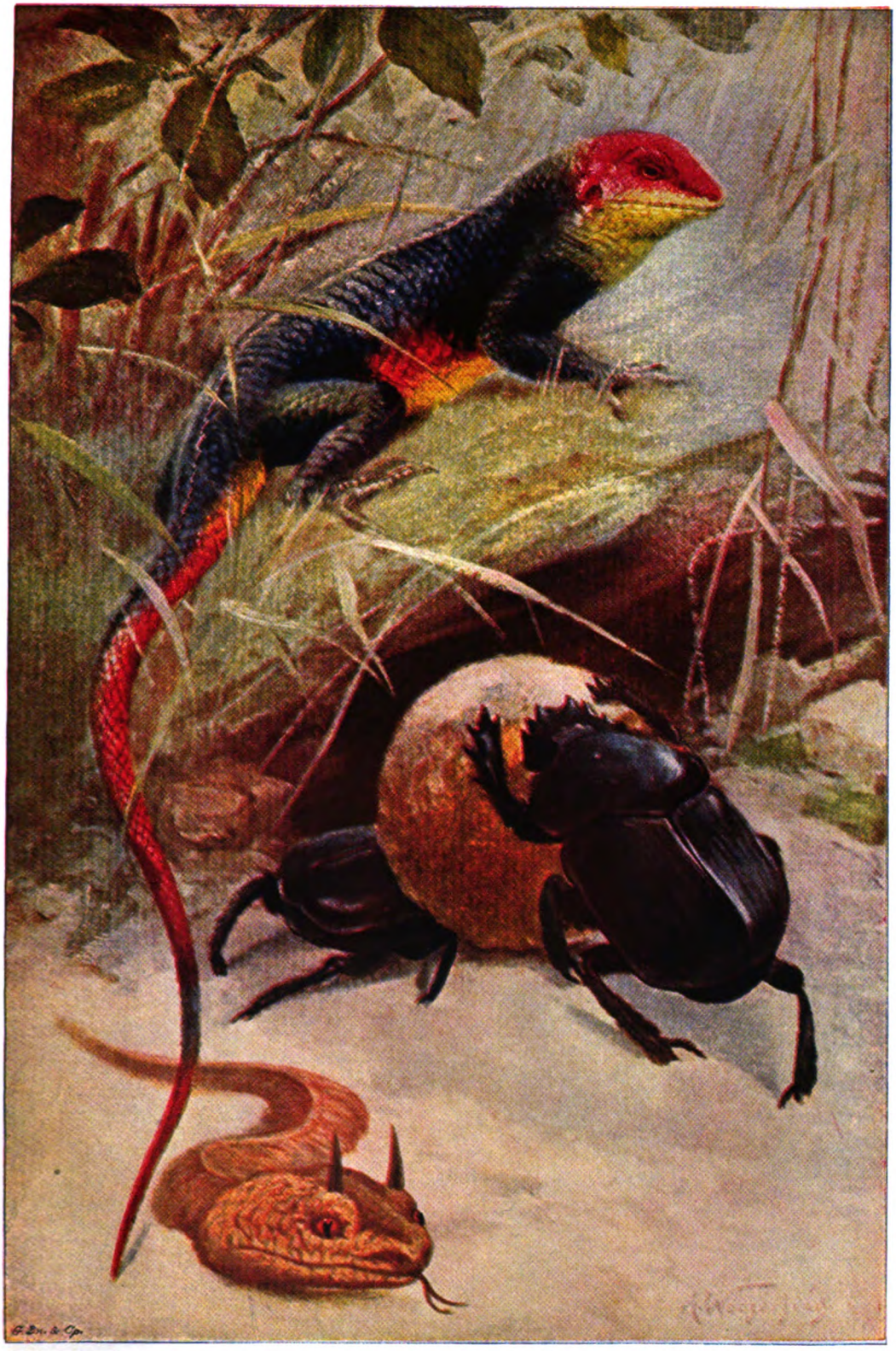
A blow on the head may cause the after-image to become less intense or to cease entirely. Electrical stimulation of the eye and optic nerve will change the character of the after-image and shorten the time of its duration. General fatigue will shorten the duration of the after-image; for example, it has been found that an after-image lasts about 30 per cent longer in the morning than in the evening. The distraction of attention in any manner has its effect on the course of the after-image; when the attention is directed wholly upon the after-image the duration is one-third longer than when the attention is not concentrated upon it.

If one eye only be stimulated, an after-image may appear in the unstimulated eye. Four hypotheses have been offered to explain this transfer of the image from one eye to the other: (1) The appearance is a phenomenon of binocular contrast. When one eye is stimulated by a bright colored light, and the other eye is stimulated by a very little gray light or is protected from all light, the contrasted color may be seen in the unstimulated eye during the time of stimulation, and this may leave an after-image in that eye. (2) A second hypothesis is that the eyes are accustomed to function together, and whatever affects one retina affects the other also. This may be considered as a modified form of the first hypothesis. (3) Another hypothesis is that the after-image has its seat in the centres in the brain, not in the end organ or retina, and that it may be seen in whichever eye is open. This hypothesis seems to be overthrown by the fact that an electrical stimulation of the optic nerve produces a sensation like that produced by a flash of light, but no after-image follows. Another fact difficult for this hypothesis to explain is that if one eye be stimulated the after-image appears in the other eye only in case that eye be well darkened. (4) A fourth hypothesis is that the transfer of the after-image is not real but only apparent. In support of this hypothesis it has been found that when "that portion of the right eye which corresponds to the blind spot of the left eye was stimulated" (Franz), there was an apparent transfer of the image to the left eye; also if the unstimulated eye be disturbed or interfered with during the course of the after-image no change in the image may be observed, whereas if the stimulated eye be interfered with the image disappears. Consult Fechner. 'Elemente der Psycho-physik'; Franz, S. I., 'After-Images' (Monograph Supplement, Vol. III, No. 2, 1899, Psych. Rev.); Titchener, E. B., 'Ueber binocular Wirkungen monocular Reize.' See EYE; VISION.

AGABUS, ă'-gą-bŭz, a prophet residing in Jerusalem in the time of Paul and said by tradition to be one of the 70 disciples of Jesus

[illegible]

AGABUS, a'ga-bus, a prophet [illegible] in Jerusalem at the time of Paul and [illegible] tradition to be one of the 70 disciples of [illegible]



LIZARD (*Agama colonorum*) BEETLE (*Ateuchus sacer* HORNED VIPER (*Cerastes cornusus*

Christ. He predicted a famine in the year A.D. 43, which occurred in the next year (Acts xi, 27, 28) but was probably confined to Judea. According to Josephus many poor Jews were relived by the Queen of Adiabene, who purchased corn in Egypt for them. Later Agabus predicted to Paul that he should suffer if he went to Jerusalem (Acts xxi, 10–12). The Greek Church holds that later Agabus suffered martyrdom, and observes his festival on 8 March.

AGADES, ä'gą-dez, Africa, a town near the middle of the Sahara, capital of the oasis kingdom of Air or Asben; at one time a seat of great traffic, probably containing 60,000 inhabitants. It has a population of about 6,000.

AGADIR, ä-ga-dēr', an Atlantic seaport of Morocco, northwestern Africa, 375 miles from Tangier and 64 miles from Mogador, in lat. 30° 27′ N. and long. 9° 36′ W. It is famous simply because its name has been so prominently associated with the Franco-German crisis of 1911. In the summer of that year, while France was establishing a protectorate in Morocco against the wishes of the inhabitants, the German warship Panther was suddenly sent to Agadir. The most powerful of the Moroccan chiefs were entertained aboard and were promised German support in resisting French control. For a time war seemed imminent between France and Germany, both nations mobilizing troops on their frontiers. After some delay an accord was published on 3 November in which Germany recognized the right of France to establish a protectorate in Morocco, and France ceded to Germany about 250,000 square kilometers of land in the French Kongo, bordering the German colony of Kamerun, and other commercial and economic provisions were added. Both nations engaged to obtain the adhesion to this accord of the other nations who were signatories of the Algeciras act. At the waterfront there is a miserable hamlet of fishermen called Fonti; the town itself, built on the crest of a hill about 660 feet in height and a short distance away, is surrounded by walls with Saracenic towers. It was an outpost of Moroccan Islam: a closed port — closed, that is, to general commerce. Pop. about 1,000. Consult: Albin, P., 'Le "Coup" d'Agadir: origines et développement de la crise de 1911' (Paris 1912); also 'Agadir et la stratégie navale' (Rev. de Paris, 18th year, Vol. VI, pp. 809–822).

AGAG, ā-gag, (1) in Jewish history, a king of the Amalekites saved by Saul out of the slaughter of his people, and hewn in pieces by Samuel before Yahwe's altar; evidently a survival of human sacrifice. (2) A character in Dryden's 'Absalom and Achitophel,' representing Sir Edmund Berry Godfrey, the London magistrate found murdered shortly after taking Titus Oates' deposition concerning the imaginary "Popish Plot."

AGALACTIA, a deficiency, either of quality or quantity, in the secretion of milk after delivery. It may be due to a number of causes, as poor diet, hemorrhage, or exhausting diseases such as syphilis, or phthisis, or even by emotional disturbances. A good diet with plenty of milk and cream will often increase the secretion of milk. Malt liquors (porter, stout) are helpful in small quantities. Drugs are of no value. Agalactia is contagious in sheep and goats. It is accompanied when acute by a high fever and has a mortality of 15 per cent. It is very frequent in Italy, France and Spain.

AGALMATOLITE, ag-al-mat'ō-līt (from the Greek words *agalma*, image, and *lithos*, stone), a soft, massive stone, grayish or greenish in general hue, and often yellow, brown and red, or streaked with those colors. It is soft enough to be cut with a knife and it takes a good polish. The Chinese use it for carving images, notably small pagodas and grotesque figures of animals and men; ingenious advantage often being taken of its varied colors for the production of odd effects. The hardness of the Chinese variety is mostly from 2.0 to 2.5, and its specific gravity about 2.8. It is not a definite mineral, some specimens being silicious pinite, while others are referable to pyrophyllite and steatite.

AGAMA (Caribbean name), a genus of lizards, typical of the large and important family *Agamidæ*, which is distributed over all Africa (except Madagascar), Arabia, Asia south of the Caucasus and Himalayan Mountains, the Malayan Islands and Australia. None are found in the New World. They are closely related to the iguanas, and are characterized by acrodont dentition (that is, the teeth surmount ridges of the jaw), a broad and short tongue, and the absence of bony tubercles (*osteoderms*) in the skin, but large and numerous spines are often present. They may have brilliant colors, but many are dull, desert-inhabiting species. Some have parachutes, as the flying dragon, and others defensive appendages, as the frilled lizard. Prominent examples are the dragons, bloodsuckers, false chameleons, frilled lizards, spiny-tailed desert lizards, dabs, molochs and related forms elsewhere described under their own names. The family contains about 200 species arranged in about 30 genera, and is most numerous in the region from India to Australia.

AGAMEMNON, in the Iliad, is the Greek "great king" or "king of kings," the overlord of Greece both north and south of the Gulf of Corinth; the royal seat is at Mycenæ in the Peloponnesus. He is represented as a rather weak man, presiding over a turbulent assembly of practically independent feudal chiefs, who will not openly defy him because he is consecrated to his position by Zeus, but who are entirely independent as regards their individual districts, though bound to follow him to war when ordered. His character is of course purely the invention of the poet, and its relation to that of Achilles and other chiefs is curiously like that of Charlemagne to Roland and the peers in the *chansons;* the dashing noble being the real hero, and the monarch slurred as rather petty, unjust and capricious, king by grace rather than special merit. But the position is not fictitious. Archæology has proved that Mycenæ was really the seat of a wealthy and powerful monarchy, probably about 1500 B.C. and somewhat after, as well as that several Troys flourished and perished; and these proofs that the basis of the story was traditional and not mythical naturally tempt the sanguine to hope for further points of truth,

which research tends steadily to justify. As to the character of the monarchy, later theorists take the reverse view from the earlier. Grote held that the account in Homer showed the germ of a developing constitutionalism, the criticising commons who were becoming a thorn in the monarch's flesh being satirized and caricatured in Thersites, and the king only an Aryan chief elected by his equals; Mahaffy thinks it the decay of a monarchy of the Oriental type, the feudal anarchy indicating breakdown instead of growth. In the legend he is the son of Atreus (q.v.), and brother of Menelaus, King of Sparta, whose wrong in the seduction and carrying away of his wife Helen by Paris, son of Priam, King of Troy, he avenges by a levy of all the Greeks to make war on Troy, when its King, Priam, will not give up Paris or make him give up Helen. (See HELEN; ILIAD; TROY). The sacrifice of his daughter Iphigenia (q.v.), to secure a passage from Aulis, is a later fiction and recalls Jephthah and his daughter curiously. His quarrel with Achilles is the theme of the Iliad. When Troy was sacked he received Priam's prophetess-daughter Cassandra (q.v.) among his share of the spoils. Returning home after 10 years' absence, he was murdered by his cousin Ægisthus, son of Thyestes (see ATREUS), aided by Agamemnon's wife Clytemnestra (q.v.) with whom he had been living in adultery for a short time previously; and his son Orestes on growing up avenges him by killing his mother, his sister Electra abetting. In Homer the motive for Agamemnon's murder is simply that of any adulterous pair in ridding themselves of an inconvenient husband; in Æschylus' 'Agamemnon,' Clytemnestra slays him with her own hand, professedly in revenge for his sacrifice of Iphigenia, obviously sharpened by jealousy of Cassandra, and throwing the ultimate responsibility on Nemesis, who is pursuing the house of Atreus.

AGAMENTICUS, Mount, a noted landmark in York County, Me., near which one of the earliest settlements in this territory was made in 1631. It is a few miles back from the shore and rises to the height of 673 feet.

AGAMIDÆ, a large family of lizards, including about 200 species, all dwelling in the warmer parts of the Old World. They are of moderate size, active, with well-developed limbs, are of both terrestrial and arboreal habits and mostly insectivorous. The tongue of all is broad and short; the skin often spiny and changeable in color. In this family are many common and familiar lizards of the Mediterranean region as well as of the East, including the flying dragon, the moloch, the frilled lizard of Australia and others elsewhere described by name.

AGAMOGENESIS. See PARTHENOGENESIS.

AGAÑA, äg-än'ya, the principal town of Guam, the largest of the Ladrone Islands, 1,500 miles east of Luzon, Philippines, and 1,300 miles south of Yokohama. The Ladrone, or Marianne, group belonged to Spain; but, as a result of the war between the United States and Spain in 1898, the former took possession of the island of Guam, and in 1899 established a naval station and seat of administration at Agaña, with Capt. Richard P. Leary, U.S.N., as first governor. The town contains the usual public buildings of a military station, and a college.

AGANIPPE, -nip'ē, a fountain on Mount Helicon, in Greece, sacred to the Muses, which had the property of inspiring with poetic fire whoever drank of it.

AGAPE, ag'a-pē (Gr. *agapē*, love), in ecclesiastical history, the love-feast or feast of charity, in use among the primitive Christians, when a liberal contribution was made by the rich to feed the poor. During the first three centuries love-feasts were held in the churches without scandal, but in after-times the heathen began to tax them with impurity and they were condemned at the Council of Carthage in 397. Some modern sects, as the Wesleyans, Sandemanians, Moravians, etc., have attempted to revive this feast.

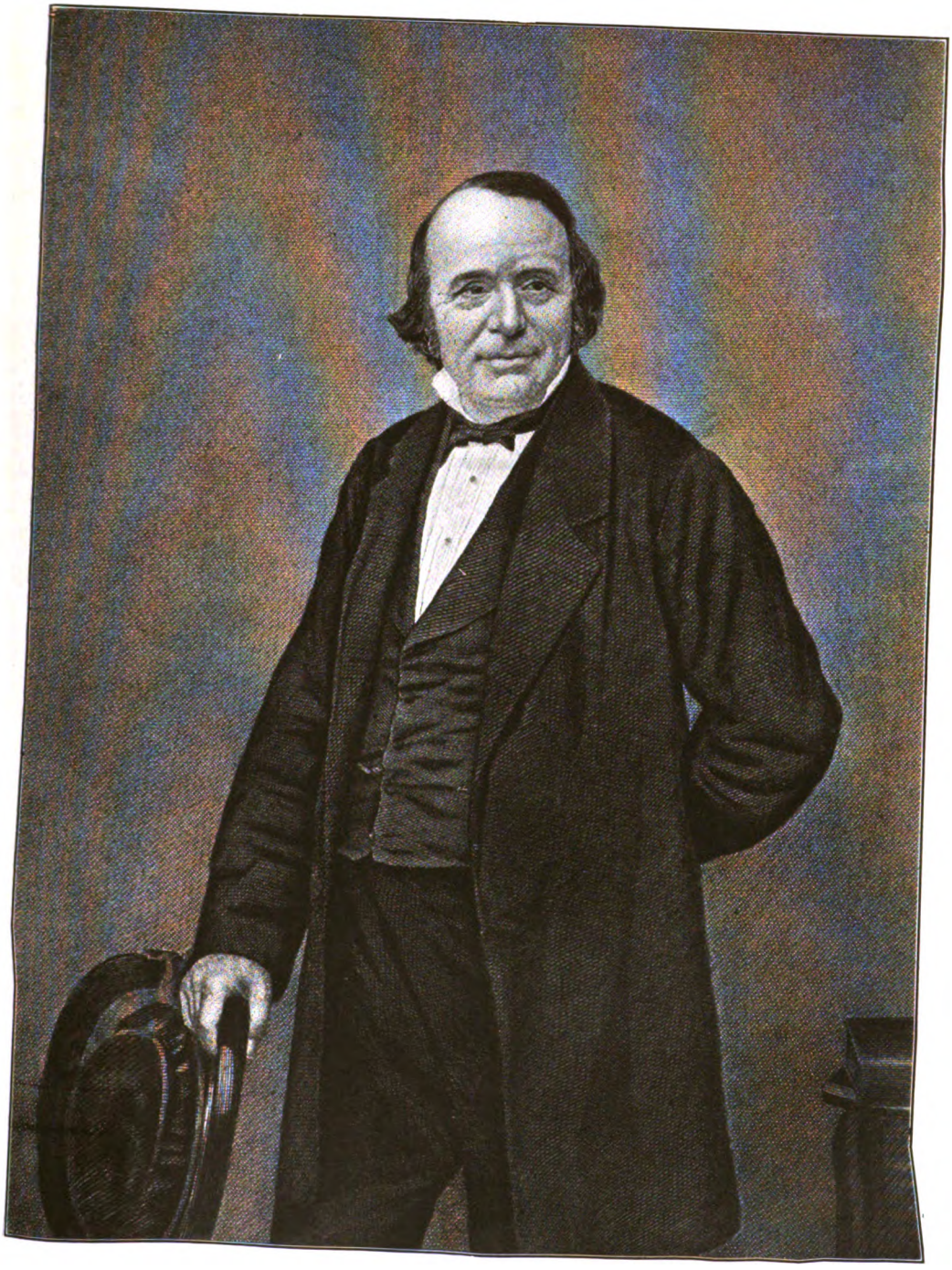
AGAPEMONE, ag-a-pem'o-nē (lit. "the abode of love"), the name of a singular conventual establishment which was founded at Spaxton, near Bridgewater, Somersetshire, in 1859, the originator of it being a certain Henry James Prince, at one time a clergyman of the Church of England, who called himself the Witness of the First Resurrection. The life spent by the inmates appeared to be a sort of religious epicureanism. Some of the proceedings of the inmates of the "Abode of Love" resulted in applications to the courts of law, where parties formerly members of the society having returned to the world sought to regain their rights from Prince and his followers, such cases naturally causing some scandal; but the sect has been scarcely heard of for some years.

AG'APHITE, a name given to the turquois (q.v.) by Fischer in 1806, in compliment to the naturalist Agaphi. It is no longer in general use.

AGAR-AGAR, ä'gär-ä'gär, also known as Bengal isinglass. A dried seaweed or vegetable gum obtained from Singapore. It is almost completely soluble in water, dissolving to a tasteless and odorless mass. It is much used as a culture medium in bacteriology.

AGAR'IC (*Agaricus*), a genus of fungi, characterized by having a fleshy cap or pileus and a number of radiating plates or gills on which are produced the naked spores. The majority of this species are furnished with stems, but some are attached to the objects on which they grow by their pileus. Over a thousand species are known, and are arranged in five sections according as the color of their spores is white, pink, brown, purple or black. Many of the species are edible, like the common mushroom (*A. campestris*), and supply a delicious article of food, while others are deleterious and even poisonous. See FUNGI; MUSHROOMS.

AGARICIC ACID, ag-ar-is'ik, a substance having the formula $C_{16}H_{30}O_5$, which is obtained from certain species of mushrooms by extraction with ether or strong alcohol. It is also soluble in hot glacial acetic acid and oil of turpentine. It crystallizes in flat, four-sided plates, and also in prisms, according to the solvent from which it is deposited, and melts at about 290° F. It dissolves in boiling water, but crystallizes out again upon cooling. A



LOUIS AGASSIZ

similar substance, known as agaricin, is obtained from the fly-agaric by extraction with alcohol, and Jahns states that it is identical with agaricic acid. Several salts of agaricic acid are known. See AGARIC RESIN.

AGARIC MINERAL, ag'a-rik, or a-gar'ik. (1) A soft, white variety of calcite, breaking easily in the fingers and occurring in caverns and in the clefts of rocks in regions where the ground water contains much lime. (2) A variety of silicate of magnesium found in Tuscany and also known as mountain-milk or rock-milk. Bricks made from it will float in water hence it is supposed that this is the material from which the ancients made their floating bricks.

AGARIC RESIN, a red resinous substance obtained from certain mushrooms, together with agaricic acid (q.v.) by extraction with alcohol or ether. It melts at 194° F. It is insoluble in water but dissolves in absolute alcohol, ether, wood alcohol, chloroform and alkalies.

AGASSIZ, Alexander, ăg'ăs-sĭ, American scientist, son of Louis: b. Neuchatel, Switzerland, 17 Dec. 1835; d. 27 March 1910. Taken to America in 1848 and educated at Harvard College. In 1859–60 he made biological studies along the coast of California and Mexico with the United States coast survey. Later he became wealthy through investment in coal and copper mines, to which he was led by scientific knowledge and experience. On his father's death he was appointed curator of the Museum of Comparative Zoology at Harvard, but resigned in 1885 on account of ill health. In 1896 he was made an officer of the Legion of Honor. He belonged to many scientific associations, did much important work in marine dredging and the zoology of the deep sea, as well as on other subjects. His most important publications are 'North American Acalephæ' (1865); 'Marine Animals of Massachusetts Bay' (with Elizabeth Agassiz, 1871); 'Revision of the Echini' (1872); 'North American Starfishes' (1877); and 'Report on the Echini of the Challenger Expedition' (1881).

AGASSIZ, Louis, American naturalist: b. 28 May 1807 at Motier, Canton Fribourg, Switzerland; d. 14 Dec. 1873. From childhood he showed a strong bent toward zoology and, after a preparatory training at Lausanne, studied medicine and natural history at Zurich, Heidelberg and Munich, taking a degree in philosophy at Heidelberg and graduating in medicine at Munich, 1830. After this he went to Paris and worked under Cuvier until 1832, when he was called to Neuchatel as professor of natural history, and remained there until 1846, when invited to give a series of lectures in the Lowell Institute course at Boston. The success of these lectures and his desire to study the natural history and geology of America determined his permanent removal to the United States; in 1848 he was given the chair of natural history in the Lawrence Scientific School of Harvard University. With the interval of three years (1851–54) as professor in the medical college at Charleston, S. C., he continued his connection with Harvard until his death. His enthusiasm, eloquence and clearness of thought made him a pre-eminent teacher, but in his later years he was relieved from the regular duties of the school.

His first great work, 'Recherches sur les Poissons Fossiles' (5 vols., 311 plates, 1833–42) was accomplished during his professorship at Neuchatel. This was followed by 'Fossil Fishes of the Old Red Sandstone of the British Isles,' written after making several visits to England, and by the 'Nomenclatoris Zoölogicus Index' (Soliduri, 1842–46), which, revised and brought up to date by Scudder, was reissued in 1882 as Bulletin No. 19 of the United States National Museum. During this same period he had studied both living and fossil echinoderms and had spent many summers in observing glacial action. The most eminent European biologists, botanists and geologists were among his friends, and he came to America with the hope not only of advancing science by his own researches, but of waking a deeper interest than American students had yet shown in the natural sciences. His first wife had died in Europe; he remarried in America and became so engrossed with the work he had undertaken as to refuse the most flattering offers of positions in Europe. In constant demand and traveling widely as a lecturer as long as his health permitted, he was nevertheless constantly forwarding his original work. In 1848 he made a geological and biological survey of the northern and eastern shores of Lake Superior; in 1850–51 he studied the coral reefs of Florida; later he visited Brazil and the coasts of California.

His zeal was untiring, even after his health failed; besides working through all his later life on his great series, 'Contributions to the Natural History of the United States,' which he had planned on so large a scale that the four quarto volumes completed were but a beginning, he directed constant efforts toward the establishment of the Museum of Comparative Zoölogy at Harvard, giving more attention to it than to any other of his later interests. The plans for it were perfected in 1858, and through his influence the original endowment was supplemented by generous appropriations; he gave his own valuable collections to it, and his time and money as well; before his death the opportunities which he had created there had attracted a group of young men who were to become the foremost American biologists. The founding of a summer school where zoology could be studied out of doors was another of his projects, and this he accomplished on the island of Penikese, Buzzard's Bay, in 1873, just before his death.

Among his more important American publications are: 'Methods of Study in Natural History,' 'Geological Sketches,' 'The Structure of Animal Life,' 'A Journey to Brazil' and 'An Essay in Classification' (the first volume of his unfinished 'Contributions'). The amount and scope of his work, together with his great gift of awakening interest in the natural sciences and advancing new views without rousing the opposition of the dogmatic, gave him rank as the most influential of American naturalists, although many of his opinions and theories have been superseded by the Darwinian idea of evolution, which he opposed. He was buried in Mount Auburn Cemetery, where his monument is a boulder from the Aar glacier in Switzerland. Consult 'Life and Correspondence of Agassiz' (Boston 1886).

AGASSIZ, Mount, a remarkable extinct volcano situated in Arizona about 70 miles northeast of Prescott. It has an altitude of more than 10,000 feet above the sea, and belongs to the ranges of the Rocky Mountains. As a place of resort it has numerous attractions—grand scenery, elevation and proximity to the Colorado Cañon.

AGASSIZ ASSOCIATION, an organization for the promotion of nature study among youth. The society was established in 1875, and in 1902 had a membership of more than 12,000. The headquarters are at Pittsfield, Mass. The official publication is *The American Boy,* and the badge is a Swiss cross. Consult Guyot, 'Memoir of L. Agassiz' (Princeton, N. J. 1883).

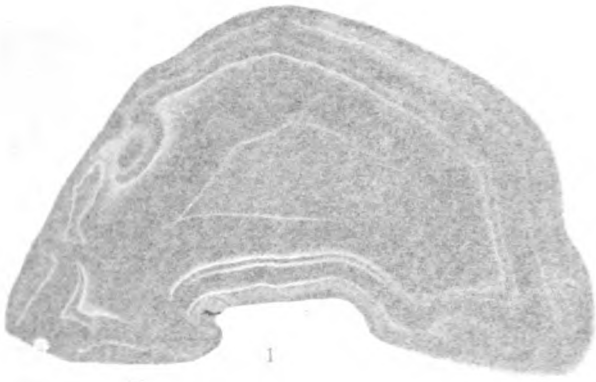
AGATE, a variety of chalcedony, or crypto-crystalline quartz, distinguished by its banded or clouded appearance or by the presence of visible impurities. "Achates" was the Greek name of a river in Sicily near which, according to Pliny, agates were first found; but the name was earlier used by Theophrastus in his treatise 'On Stones,' published about 315 B.C., while agate is mentioned in Exodus xxviii, 17 as one of the precious stones in the breastplate of the high priest. Its history, therefore, extends over a period of at least 3,400 years.

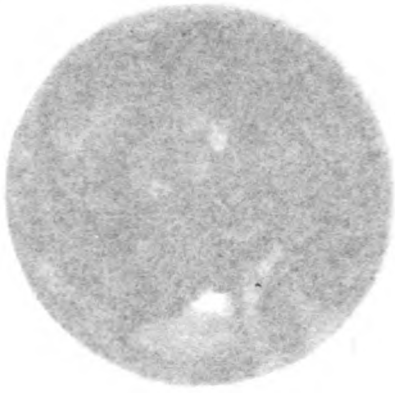
The method of formation of banded agates has been carefully studied by numerous investigators. M. F. Heddle (consult *Nature,* Vol. 29, p. 419) assumes the existence of a cavity in a trap rock which is lined during its solidification with a thin layer of green celadonite or delessite. The rock subsequently rots, and its feldspar is decomposed by water containing carbonic acid, which thus becomes highly charged with silica. This is transfused into the cavity, coagulates and is deposited on its walls. The banded structure is due to the intermittent deposition of successive layers of silica from the highly siliceous solution. It was long supposed that after the earlier layers were deposited fresh supplies of the solution passed inward through a hole called the "inlet of infiltration." This canal is often distinctly seen in agates, but the weight of evidence now seems to favor the hypothesis that the external solution supplies the silica by osmosis (q.v.). The internal solution becomes less dense as it is relieved of silica by its deposition on the walls of the cavity, and it is then replaced by the denser external solution which passes through the layers of agate already formed. If the conditions remain unchanged the process continues until the entire cavity is filled, but agates are not infrequently found with a cavity in the centre, or with crystallized quartz (often amethystine) lining the interior. Such distinctly crystallized portions may be succeeded by further deposits of the cryptocrystalline chalcedony. The successive layers often differ much in density, hardness, color and transparency. Sir D. Brewster has shown that some of the layers are so exceedingly thin that it would take 55,760 to measure an inch. (*Philosophical Magazine* (3) XXII, p. 213). These layers are deposited all around the cavities, following all of their irregularities. The beauty of agates is thus greatly enhanced by extreme delicacy of their banding. Sometimes these bands concentrically encircle a dark spot, forming a "bull's eye agate," or again they parallel a cavity with sharp angles, as in the "fortification agate." Other agates show horizontal layers, suggesting the query as to whether the silica had settled upon the floor of the cavity from a solution at rest. Such agates are known as onyx (q.v.), or if the colors are red and white, as sardonyx (q.v.). In clouded agates there is no distinct banded structure, but the colors shade gradually from one into another.

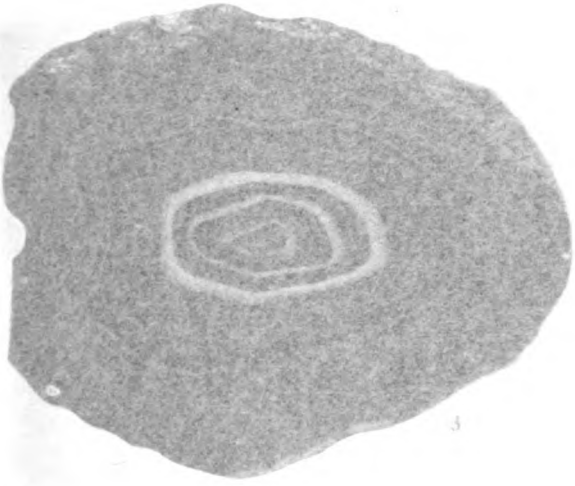
The natural colors of agates vary greatly, being usually gray or either red or brown. The colors are due to the presence of organic impurities or to the oxides of iron, manganese or titanium. Nearly all the agates now offered for sale are, however, artificially colored. The success of the process is due to the varying degrees of porosity of the different layers of agate, some of which readily absorb the fluid in which the stones are immersed, while others are impervious to it. The black and white agates are prepared by soaking the stones for several days in a warm syrup of honey and water, then immersing them in sulphuric acid, which carbonizes the honey absorbed by certain of the layers, making them dark brown or black. The red or carnelian agates are produced by a process of "burning." A grayish stone is heated in an oven for several weeks, at first gently, then it is moistened with sulphuric acid and the temperature is gradually raised to redness. Blue or "sapphire" agates are produced by steeping the stones first in a solution of a ferric salt and then in potassium ferrocyanide, thus depositing Prussian blue in the more porous layers. A green agate is secured by the aid of chromic acid or a nickel salt, while hydrochloric acid yields a yellow agate. The red and the black are much the most popular.

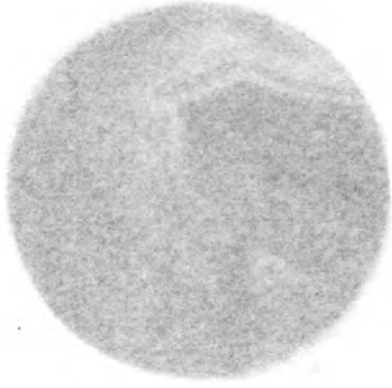
For over four centuries the headquarters of the agate industry has been in the valley between Idar and Oberstein, some 40 miles from Bingen on the Rhine. There are probably 150 agate mills working an average of three to five stones each in this little valley. These are chiefly operated by water-wheels 10 to 18 feet in diameter, abundant power being secured from the rapid mountain streams of the neighborhood. The millstones are of red sandstone, each about five feet in diameter, and rotate in a vertical plane, making about three revolutions per second. The workmen lie stretched in an almost horizontal position upon a low wooden grinding stool fitted to the chest and abdomen, leaving the limbs free. The hands are engaged in holding and grinding the agate, while the feet are firmly pressed against short stakes screwed into the floor, the reaction enabling the grinder to press the agate with much force against the moving millstone. During the process the agates glow most beautifully with a bright red phosphorescence. After having been ground the agates are polished with tripoli on cylinders of wood or a metal disc. Consult *Popular Science Review,* New Series, Vol. I, p. 23.

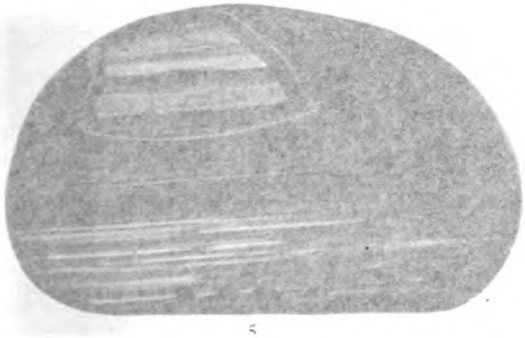
Moss-agate or "Mocha-stone" is a variety of chalcedony through which are scattered black or brown masses, more or less resembling moss. These impurities are usually one of the manganese oxides. In the Chinese moss-agate they appear as thin matted filaments of a green color, which are often artificially colored.











AGATES

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[illegible] the [illegible] industry has been in [illegible] Oberstein [illegible] each in this little [illegible] diameter, [illegible] a vertical [illegible] [illegible] p. 23

[illegible] Mocha [illegible] [illegible] which are [illegible]

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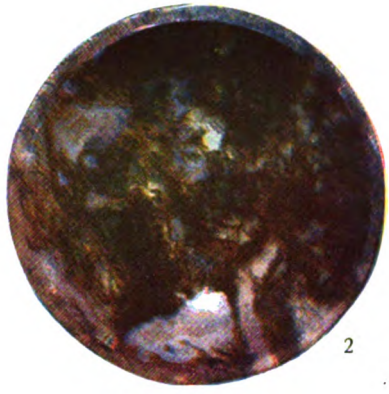

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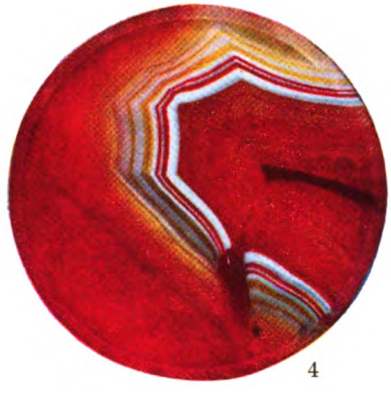

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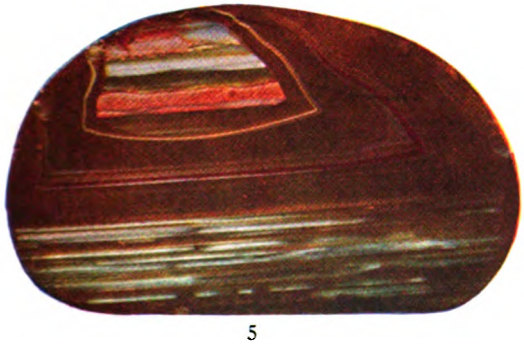

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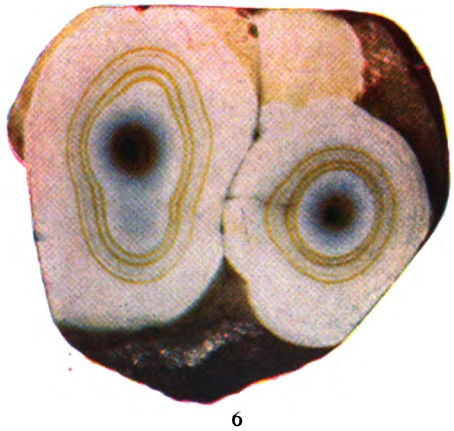

6

AGATES

1, 4, 5. Carnelian Agate or Sard Agate

2. Moss Agate

3. Onyx Agate

6. Bull's Eye Agate

Beautiful dendrites are sometimes found in chalcedony. The name dendritic-agate or tree-agate is given to these highly prized forms. Moss-agates abound at many localities in the United States, especially in Wyoming.

In the "melaphyre" of the hills around Idar, agates of considerable beauty are found. Formerly they were extensively quarried there, but since 1827 the lapidaries of Idar have secured their supplies largely from Uruguay and Brazil, which countries have long furnished nearly the entire commercial supply, though Scotch agates are marketed to some extent. Small banded agates of much beauty abound on the shores of Lake Superior; large and fine specimens occur plentifully in western Texas. Agates abound in many other regions, while very many localities yield choice agates sparingly. Most of the polished agate specimens and novelties of the tourist resorts, though often purporting to be of local origin, come from Brazil or Uruguay and are polished in Germany.

Agate is used in making burnishers and agate mortars and pestles and, owing to its hardness, for the knife edges of balances. It is worked up as a decorative stone into vases, dishes, ash trays, paper weights, paper cutters, etc., and is mounted as a semi-precious stone in a great variety of objects, such as jewel boxes, glove or shoe buttoners, watch charms, letter openers and scarf pins. Every boy is familiar with agate marbles, but the cheaper grades of these are only glass. From the earliest times the black and white banded agates (see ONYX) and the red and white (see SARDONYX) have been used for seal rings and for carving cameos. The ancients also regarded agate as a charm against the intoxication of love. Consult Ruskin, 'On Banded and Brecciated Concretions' (in *Geological Magazine*, 1867 to 1870); 'Ethics of Dust,' p. 190; 'The Vale of Idar,' by S. Weisse (in *Blackwood's Magazine*, Vol. cxlviii, pp. 75 and 208).

GEORGE LETCHWORTH ENGLISH.

AGATE-SHELL, or **AGATE-SNAIL,** a land-snail of the carnivorous genus *Achatina* of the family *Helicidæ*. They are abundant in tropical Africa; the largest of all land-snails are found among them, and many species have brightly colored shells.

AGATHA, Saint, a lady of Palermo, martyred by Quintilian, the pro-counsul of Sicily, in the persecution of Decius, because she would not perform idolatrous worship or submit to his impure desires, c. 251 A.D.

AGATHARCHIDES, ăg-ą-thar'kĭ-dēz, or **AGATHARCIDES,** ăg-ą-thar'sĭ-dēz, a Greek writer on geography: b. at Cnidos in Asia Minor; lived 250 B.C. and wrote numerous works; among them, one on the Erythræan Sea, of which some extracts have been preserved. He is the earliest extant writer who attributes the annual rise of the Nile to the periodical rains in the upper regions of that river.

AGATHARCHUS, ăg-a-thar'kŭz, Greek painter: b. Samos, about 430 B.C. He worked at Athens between 455 and 415 B.C. He is regarded as the first scene-painter, having painted a scene for a tragedy of Æschylus. His art was important because of the development of perspective. He is said to have written a treatise on this subject.

AGATHIAS, a-gā'thi-as, Greek poet and historian, about 536–81. He collected a "Cycle" of contemporary poems, in which were a few of his own compositions. We have still 101 of his 'Epigrams' and the whole of his 'History' of the years 553–58.

AGATHO, Saint, ag-ath'ō, Pope of Rome from 678 to 681, surnamed "Thaumaturgus — the Wonderworker," from the many miracles he wrought. He was born in Sicily and was over 100 years old when he was elected Pope. He was instrumental in arranging the 6th Ecumenical Council held at Constantinople in 680 which practically ended the Monothelite heresy. His feast-day is celebrated by both the Greek and Roman churches. He died at Rome 10 Jan. 681.

AGATHOCLES, ag-ath'ō-klēz, Syracusan of low extraction, who became ruler of a great part of Sicily. He was remarkable for beauty, strength and capacity for enduring labor. In the outset of life he belonged to a band of robbers; afterward he served as a private soldier, rose to the greatest honors and made himself master of Syracuse. He conquered the greater part of Sicily, 317 B.C. Being defeated at Himera by the Carthaginians, he carried the war into Africa, where for four years he extended his conquests over his enemy. He afterward passed into Italy and made himself master of Crotona. In his 72d year he was poisoned by his grandson Archagathus, 289 B.C., after a reign of 28 years of great prosperity mingled with the deepest adversity. His son-in-law, Pyrrhus, King of Epirus, inherited his influence in Sicily and southern Italy.

AGATHON, ag'a-thon, Greek tragic poet (448–402 B.C.). He was a close friend of Euripides and of Plato; and the famous 'Symposium' of Plato immortalizes the banquet given on the occasion of Agathon's dramatic triumph, 416 B.C.

AGAVE, ag-ā'vē, daughter of Cadmus and Hermione, married Echion, by whom she had Pentheus, who was torn to pieces by the Bacchanals. She is said to have killed her husband while celebrating the orgies of Bacchus. She received divine honors after death.

AGAVE, a genus of remarkable and beautiful plants, of the family *Amaryllidaceæ*, having a tubular perianth with 6-partite limb and triangular many-seeded capsule. They resemble aloes in their growth and general appearance, and the best-known species, *Agave americana*, is sometimes known as the American aloe. This is a large plant, the leaves of which are thick, fleshy and spiny-toothed at the edge, and the stem branched and of great height. The flowers have the tube of the corolla narrowed in the middle, the stamens longer than the corolla and the style longer than the stamens. This magnificent native of North America, probably of Mexico, is by no means an uncommon plant in gardens, but is seldom seen there in flower. There is indeed a notion, but an erroneous one, that the American aloe does not bloom until it is 100 years old. The fact is that the time of flowering depends almost wholly on the rapidity of its growth. In hot countries it will flower in a few years, but in colder climates, the growth being slower, it is necessarily longer in arriving at maturity.

The stem, which bears the blossoms, rises from the centre of the leaves and when the plant is in a vigorous state it frequently exceeds the height of 20 feet. Branches issue from every side and in such a manner as to form a kind of pyramid, composed of greenish-yellow flowers, which stand erect and are seen in thick clusters at every joint. When in full flower its appearance is extremely splendid; and if the season be favorable, and the plant be sheltered from the cold in autumn, a succession of blossoms will sometimes be produced for nearly three months. In the warmer parts of Europe the American aloe is cultivated as an object of considerable utility. They are frequently set out in rows as fences for inclosures, particularly in Spain, Portugal and Italy. In some parts the leaves are employed for scouring pewter, kitchen utensils and floors. The juice of these leaves is made into cakes, which are used for washing and will make lather with salt water as well as with fresh. The sap of certain species when fermented yields a beverage resembling cider, called by the Mexicans *pulque*. By distillation it yields two intoxicating beverages very widely used in Mexico — *mescal* and *tequila*. The leaves are used for feeding cattle; the fibres of the leaves (called *pita, sisal hemp* or *henequen*) are formed into thread, cord and ropes. The leaves also, roasted, were formerly used for food by the Indians.

AGE, any period of time attributed to something as the whole, or part, of its duration; as the age of man, the several ages of the world, the Golden Age.

In law, the time of competence to do certain acts. In the male sex 14 is the age when partial discretion is supposed to be reached, while 21 is the period of full age. Under seven no boy can be capitally punished; from seven to 14 it is doubtful if he can; at 14 he may. At 12 a girl can contract a binding marriage; at 21 she is of full age. In mediæval times, when a girl reached seven, by feudal custom or law a lord might distrain his tenants for aid to marry, or, rather, betroth her; at nine she was dowable; at 12 she could confirm consent to marriage which she had previously given; at 14 she could take the management of her lands into her own hands; at 16 she ceased, as is still the law in England, to be under the control of her guardian; and at 21 she might alienate lands and tenements belonging to her in her own right. At common law the age of discretion for female infants was 12 and the age of consent to unlawful carnal intercourse was 10, but by recent legislation the age of consent has been raised in the United States to 14, 15, 16 and, in several States, to 18 years. For the modern law of infancy consult Schouler, 'Treatise on the Domestic Relations' (Boston 1870). In the United States at 25 years of age a man may be a representative in Congress; at 30 a Senator and at 35 he may be chosen President. The age of serving in the militia is from 18 to 45 inclusive.

In England no one can be chosen a member of Parliament under 21 years of age, nor be ordained a priest under the age of 24, nor made a bishop until he has become 30 years of age. The age of serving in the militia is from 16 to 45 years. The sovereignty of the realm is assumed at 18; though the law recognizes no minority in the heir to the throne.

In French law, a person must have attained the age of 40 to be a member of the legislative body; 25 to be a judge of a tribunal *de première instance;* 27 to be its president, or to be judge or clerk of a cour royale; 25 to be a justice of the peace; 30 to be judge of a tribunal of commerce, and 35 to be its president; 25 to be a notary public; 30 to be a juror. At 21 both males and females are capable of performing all the acts of civil life.

In Archæology.— The Danish and Swedish antiquaries and naturalists, MM. Nilson, Steenstrup, Forchamber, Thomsen, Worsaae and others, have divided the period during which man has existed on the earth into three — the Age of Stone, the Age of Bronze and the Age of Iron. During the first mentioned of these he is supposed to have had only stone for weapons, etc. Sir John Lubbock divides this into two — the palæolithic, or older, and the neolithic, or newer, stone period. At the commencement of the age of bronze that composite metal became known and began to be manufactured into weapons and other instruments; while, when the age of iron came in, bronze began gradually to be superseded by iron. Consult Lyell's 'Antiquity of Man' and Lubbock's 'Prehistoric Times.'

In Physiology.— If the word age be used to denote one of the stages of human life, then physiology clearly distinguishes six of these, viz., the periods of infancy, of childhood, of boyhood or girlhood, of adolescence, of manhood or womanhood and of old age. The period of infancy terminates at two, when the first dentition is completed; that of childhood at seven or eight, when the second dentition is finished; that of boyhood or girlhood at the commencement of puberty, in temperate climates from the 14th to the 16th year in the male and from the 12th to the 14th in the female; that of adolescence extends to the 24th year in the male and the 20th in the female; that of manhood or womanhood stretches on till the advent of old age, which comes sooner or later, according to the original strength of the constitution in each individual case and the habits which have been acquired during life. The precise time of human existence similarly varies. See LONGEVITY.

In Geology.—Age, as used by geologists, represents a subdivision of time variously evaluated. It has been used as the equivalent of Era (q.v.), but as now generally understood constitutes a subdivision of an epoch.

Ages of the World.— We find the ages of the world mentioned by the earliest of the Greek poets. Hesiod speaks of five distinct ages: (1) The Golden or Saturnian Age, when Saturn ruled the earth. The people were free from the restraint of laws; they had neither ships nor weapons, wars nor soldiers; the fertile fields needed no cultivation, and perpetual spring blessed the earth. (2) The Silver Age, which he describes as licentious and wicked. (3) The Brazen Age, violent, savage and warlike. (4) The Heroic Age, which seemed an approximation to a better state of things. (5) The Iron Age, when justice and honor had left the earth. The poet supposed this to be the age in which he himself lived. The idea of ages of the world is interwoven with the

religious sentiments of various nations. We find examples of it in the thousand years of the Millenarians and in the four *yugas* or ages of the Hindus. The first or Krita Yuga, a kind of Golden Age, lasted, according to their tradition, 4,000 divine years, each equal to 360 solar years, and adding its fore and after "twilight," 1,728,000 solar years in all; men then lived 400 years and were all giants; then the god Brahma was born. In the second period, the Tretâ Yuga, which lasted 3,000 divine and 1,296,000 solar years in all, men lived only 300 years and vice began to creep into the world. During the third age or Dwâpara Yuga, which lasted 2,000 divine and 864,000 solar years, men lived only 200 years owing to the increase of vice. The last age, the Kâli Yuga, that in which we now live, is to last for 1,000 divine or 432,000 solar years and the life of man is sunk to one-fourth of its original duration.

Age of Animals.—The duration of life in animals is generally between seven and eight times the period which elapses from birth till they become adult; but this rule, besides being vague and indefinite, is quite useless in practice, because it affords no scale of gradation which would enable us to ascertain the precise age of individuals, the only inquiry of real importance or of practical application to the interests of society. More certain and scientific principles are derived from observing the growth and decay of the teeth. See CATTLE; HORSE.

AGEN, a-zhan, one of the oldest towns in France, capital of the department of Lot-et-Garonne, on the Garonne, 74 miles southeast of Bordeaux. A fine stone bridge of 11 arches spans the river here, and the aqueduct bridge of the *Canal Latéral* is another striking structure. The town has been an episcopal see with a cathedral since the reign of Clovis, prior to which it was a Roman station. It commands an extensive agricultural trade, owing to its position between Bordeaux and Toulouse.

AGENCY, in its widest sense includes every relation in which one person acts for or represents another by his authority. In the more restricted sense in which the term is used in the law of principal and agent, agency may be defined as the relation which results where one person, called the principal, authorizes another, called the agent, to act for him, with more or less discretionary power, in business dealings with third persons. It is a representative relation, its fundamental maxim being, *Qui facit per alium facit per se.* The agent represents, acts for, and derives his authority from another, his principal; he is an attorney standing in the place of his employer. It is also a fiduciary relation which is one of trust and confidence. See AGENT.

AGENT, in law, one person who acts for another, called the principal. If a person acts as agent without authority, the subsequent ratification of the act will make it binding on the principal just as if he had originally directed it. When an agent acts within the scope of his employment he may bind his principal, and the principal is liable for any fraudulent acts or wrong-doings of the agent so acting. If the agent, having power to bind his principal, does so expressly, he is not liable; but if he exceeds his authority he becomes personally responsible. The agent is bound to obey the instructions of the principal, and if, in violating them, he binds his principal to a third person, he is personally liable to make compensation. He cannot deal in his principal's affairs to his own profit. The right on the part of an agent to act is called his authority or power. The authority or power must in some instances be exercised in the name of the principal, and the act done is for his benefit alone. As a general rule, an agent cannot delegate his authority without special authority from his principal, consequently an agent cannot create a subagent without special permission. Any person may act as agent whom the principal wishes to appoint. So broad is this rule that married women and infants, who are incapable of acting in their own behalf, may act as agents, for the appointment takes away the legal insufficiency and permits them to bind their principals when they could not bind themselves. The mode of appointment depends upon the nature of the agency. By a rule of law the evidence of appointment must be of as high a nature as the thing to be done. Thus, to execute a writing under seal, the appointment must be under seal. When the authority or power is coupled with an interest, or when it is given for a valuable consideration, or when it is a part of a security, then, unless there is a special agreement that it shall be revocable, it cannot be revoked. Death, insanity, bankruptcy, the extinction of the subject-matter of the agency or the execution of the trust will usually terminate the agency unless the authority is coupled with an interest. Upon the law of agency is based to a large degree the law of partnership.

AGENTS-GENERAL, representatives in London of the self-governing British colonies.

AGE OF CHIVALRY, The, or **THE LEGENDS OF KING ARTHUR,** by Thomas Bulfinch, was published in 1858. More than 20 years after an enlarged edition appeared under the editorship of Edward Everett Hale. In Part I the legends of King Arthur and his knights are considered. Part II deals with the Mabinogion, or ancient prose tales of the Welsh; Part III with the knights of English history, King Richard, Robin Hood and the Black Prince. From the time of its first publication the popularity of the book has been great. No more sympathetic and fitting introduction could be found to the legends of chivalry.

AGE OF FABLE, The, or **THE BEAUTIES OF MYTHOLOGY,** by Thomas Bulfinch, was published in 1855, and republished in 1882 under the editorship of Edward Everett Hale. It has become a standard work upon mythology, by reason of its full and extensive treatment of the Greek and Roman myths.

AGE OF REASON, The, by Thomas Paine, was first published in a complete edition 25 Oct. 1795. In 1793 the first part appeared, but no copy bearing that date can be found. Part I consists of an inquiry into the bases of Christianity, its theology, its miracles, its claims of revelation. The process is destructive and revolutionary. In Part II the author makes critical examination of the Old and New Testament, to support the conclusions and inferences

of Part I. Yet the work is not wholly negative. «The Word of God is the creation we behold.»

AGERATUM, a-ger'a-tum, a genus of plants of the family *Asteraceæ* (belonging to the Eupatorium tribe of the order), chiefly natives of the warmer parts of America. One species, *A. houstonianum,* is an annual plant of flower borders and has densely clustered heads of lavender-blue flowers. Several others are also grown in gardens, some of them with purple, white or pale blue flowers.

AGESANDER, a Greek sculptor of the Rhodian school, who with Polydorus and Athenodorus, 42–21 B.C., are mentioned by Pliny as authors of the famous Laocoon group, discovered near the baths of Titus in 1506, and now in the Vatican at Rome.

AGESILAUS, King of Sparta: b. 442 B.C., and elevated to the throne after the death of his brother Agis II, in 398. Called by the Ionians to their assistance against Artaxerxes, he commenced his glorious career by defeating the Persians and defending Sparta against the united attack of Thebes, Corinth, etc. In a subsequent war with Thebes he had to contend against Pelopidas and Epaminondas, the greatest generals of those times. His prudence, however, saved Sparta without the hazard of a battle. He delivered it anew at the age of 80 years, though it was actually in the hands of Epaminondas. In the spring of 361 he crossed over to Egypt with a body of Lacedæmonian mercenaries, and there, after displaying much of his former ability, he died while preparing for his voyage home, in the winter of 361–360. Though small and insignificant in person he was a noble prince and almost adored by his soldiers.

AGGLOM'ERATE, in geology, a name applied to a rock consisting of angular fragments of other rocks, united or bound together by a matrix of similar materials but of finer texture. The rock is of volcanic origin, but the fragments may be either volcanic or sedimentary, having been ejected from some volcano.

AGGLU'TINATE LANGUAGES, languages in which the modifying suffixes are as it were glued on to the root, both it and the suffixes retaining a kind of distinctive independence and individuality, as in the Turkish and other Turanian tongues. Consult Max Müller's 'Lectures on the Science of Language.'

AGGLU'TINA'TION. See IMMUNITY.

AGGRADATION. See GRADATION.

AGGREGATION, States of, an expression sometimes used to signify, collectively. the various physical states in which matter can exist. For ordinary purposes it is sufficient to distinguish two fundamentally different states of aggregation, the solid and fluid; fluids being further subdivided into liquids and gases. A solid body may be defined as one that is capable of resisting a considerable shearing-stress. It is important to note, however, that a true solid does not yield continuously to a small deforming force; it resists deformation, and its resistance increases as the deformation increases. A fluid, on the contrary, is a body having almost no shearing-strength and offering very little resistance to forces that tend to change its shape. A fluid yields continuously to a deforming force, and a force that will deform it at all will deform it indefinitely, so long as it is allowed to act. Considering the subdivision of fluids into gases and liquids, it may be said that a gas is a fluid that presses continuously and in every direction on the walls of the vessel containing it, and which follows them indefinitely if they retreat. A gas, if left to itself, tends to expand infinitely in every direction. A liquid may be defined as a fluid which does not follow the walls of the containing vessel if they retreat, and which has no tendency to sudden and indefinite expansion when freed from all restraint.

These distinctions between the various states of aggregation in which matter occurs are to a certain extent arbitrary, elastic, indefinite and inexact. For example, certain kinds of pitch resist the action of deforming forces that are applied for a short time only, and are brittle enough to fracture, like glass, under the influence of a sudden stress; yet they yield slowly but continuously to very small deforming forces, when those forces act for a long time. A body of this sort, strictly speaking, is neither a solid nor a liquid, and to include it in a general classification we should have to have a «semi-solid» division. The distinction between liquids and gases is even more artificial than that between solids and liquids; for a liquid may be made to pass into its vapor in such a manner that it is impossible to state at what moment it ceases to be a liquid. Thus, if water is heated under a sufficiently great pressure up to 700° F., and is then allowed to expand by a sufficient amount at this temperature and is finally cooled at constant volume, we shall find, at the end of this operation, that it has been entirely transformed into steam, although we cannot say at what stage the transformation took place. See CRITICAL POINT; EQUILIBRIUM, *Chemical;* MOLECULAR THEORY; THERMODYNAMICS; MATTER.

AGHA KHAN, title of the spiritual head of the Indian Ismailites or Khodjas, a Mohammedan sect. The office is vested in a very ancient and sacred family said to be descended from Mohammed's daughter, Fatimah; but more directly from Hasan Sabbah, founder of the Ismailiah dynasty in Persia (d. 1124). This weird but mighty personage became chief of the dreaded Assassins (q.v.), well known by the Crusaders and completely exterminated by the Tartar King Halaku of Persia in 1256. The present holder of the title is the third in succession. A remarkable feature of the three Agha Khans is their absolute and whole-hearted devotion to Great Britain. Agha Khan I, Hasan Ali Shah, b. Persia 1800; d. Bombay, 12 April 1881, was governor-general of the province of Kerman under the Shah Fateh Ali. He fled from Persia in 1840 after an attempt to gain the throne, at which his family aimed, and settled in Bombay. Here he held a royal court for 30 years. He assisted the British with his private cavalry in the Afghan War, 1842, and later rendered numerous valuable services to the British government, which granted him a pension. A recognized «king without a country,» he exercised absolute control over his followers, collected a large annual tribute, and became a keen sportsman, with a special fondness for horse racing. Agha Khan II, Agha

Ali Shah, son of the preceding, reigned only four years; he continued in his father's policy, received a knighthood from Queen Victoria, and was made a member of the Bombay legislative council. He died in 1885 and was succeeded by his son: Agha Sultan, Sir Muhammad Shah, K.C.I.E., G.C.S.I., LL.D., Agha Khan III, b. 1875. He holds spiritual sway over some 60,000,000 followers in India, central Asia, east Africa, Morocco and China. At the outbreak of the European War he was visiting his adherents in Zanzibar; he not only exhorted all his people to place their personal services and resources unreservedly at the disposal of the British government, but himself volunteered to accompany the Indian Expeditionary Force as a private in any infantry regiment, since he had not had any military training to justify a commission. When Turkey entered the war he issued a powerful manifesto to Moslems throughout the empire strongly condemning her action. At the risk of his life, he visited Egypt in the critical period immediately following Turkey's adhesion to the Central Powers, and assisted in bringing about the readjustment which followed the deposition of Abbas Hilmi II (q.v.). During 1911–13 he was instrumental in soothing the grave disquietude of Indian Moslem sentiment in respect of the Turco-Italian and the two Balkan wars, urging upon his coreligionists the imperative duty of resignation to the inevitable waning of the Turkish power in Europe and of acquiescence in British policy. An enthusiastic supporter of the Allies against Germany, he has upheld their cause in public speeches and writings. In April 1916 King George, Emperor of India, granted to His Highness the Agha Khan a salute of 11 guns and the rank and status of a first class chief of the Bombay Presidency for life. This very exceptional honor is the more noteworthy as his authority is entirely spiritual and there is no state in India where he holds sway as ruler. In 1902 he was the guest of the British nation at the coronation of the King. In 1901 the Kaiser conferred on him the First Class Prussian Order of the Royal Crown.

AGINCOURT, âj'in-kōrt, or **AZINCOURT,** ä-zhăn-koor, France, a village, department of Pas-de-Calais, famous for a battle fought there 25 Oct. 1415. Henry V, King of England, eager to conquer France, landed at Harfleur, took the place by storm and wished to march through Picardy to Calais, in order to fix his winter quarters in its neighborhood. With a powerful force the Dauphin advanced against him. Henry V, retreated to the Somme. The French followed to harass his retreat and to defend the passage from Abbeville to Saint Quentin, which he gained only through the inattention of the enemy. The English, however, being destitute of everything and reduced by sickness, Henry asked for peace on disadvantageous terms. The French refused his proposals and succeeded in throwing themselves between Calais and the English. These latter consisted of 2,000 men-at-arms and 12,000 archers, and were arranged in order of battle between two hills, with the archers on the wings. Stakes, of which every man carried one, were fixed in front of them. The French, commanded by the Constable d'Albret, numbered 50,000 troops, of whom 8,000 were men-at-arms; but other estimates make the French strength much greater. They arranged themselves in two divisions, with the men-at-arms, of whom 2,000 were mounted, in front. The English first put themselves in motion. The French horse instantly hastened to meet them, but were received with such a shower of arrows by the archers that they fell back on the first division and threw it into confusion. The light-armed English archers seized their clubs and battle-axes and broke through the ranks of the French knights, who could hardly move on account of their heavy coats of mail and the closeness of their array. The English horse rushed to assist the archers; the first French division retreated; the second could not sustain the charge of the victors; and the whole French army was soon entirely routed. The victorious army, in the pursuit of the flying enemy, took 14,000 prisoners in addition to those previously captured; 10,000 Frenchmen lay dead on the battlefield. Among them was the Constable of France, with six dukes and princes. Five princes, among whom were the Dukes of Orleans and Bourbon, were taken prisoners. The English lost 1,600 men killed; among them the Duke of York, Henry's uncle, whom the Duke d'Alençon slew at his side while pressing toward the King. D'Alençon had dashed the crown from Henry's head and lifted his hand for a more effectual blow, when the King's attendants surrounded him and he fell covered with wounds.

AGIRA, ä-jē'rä, Italy, a town of Sicily, 35 miles west of Catania. It stands over 2,000 feet above sea-level and is four and one-half miles from its railway station to the south of the town. In the neighborhood are fine marble quarries which yield its chief industry. It is famous as the site of ancient Agyrion, ruled by Sicel tyrants, notably Agyris who became the leading ruler of central Sicily, and an ally of Dionysius I when they overthrew the Carthaginian invasion 392 B.C. Hercules visited Agira according to Diodorus Siculus the historian who was born here, and Timoleon 339 B.C. expelled the last tyrant, and erected several fine buildings. Pop. 22,500.

AGIS, ā'jis, the name of four Spartan kings. AGIS I, son of Eurysthenes, founder of the family Agidæ, and reputed conqueror of Helos. AGIS II, son of Archidamus II, and reigned either in 427 or 426 B.C. to 400 or 399 B.C. He was active in the Peloponnesian war; invaded Attica several times and conquered the Athenians at Mantinea in 418 B.C. AGIS III, son of Archidamus III, reigned in 338–331 B.C. He endeavored to overthrow the Macedonian power in Europe, but was routed and killed in a battle with Antipater in 331 B.C. The most important of the four kings was AGIS IV, who succeeded to the throne in 244 B.C., and reigned four years. He attempted a reform of the abuses which had crept into the state — his plan comprehending a redistribution of the land, a division of wealth and the canceling of all debts. Opposed by his colleague, Leonidas, advantage was taken of his absence in an expedition against the Ætolians to depose him. Agis at first took sanctuary in a temple, but he was entrapped and hurriedly executed by his rivals.

AGLIARDI, ą-lyär'dē, **Antonio,** Catholic cardinal and diplomat: b. Cologno (Bergamo), Italy, 4 Sept. 1832. After service in Canada as bishop's chaplain, on his return to Rome in 1884, he was appointed secretary of the Propaganda, created archbishop of Caesarea in Palestine, and proceeded to India to investigate conditions. In 1887 he returned to India as apostolic delegate to settle the Goa controversy with Portugal. He was appointed papal nuncio to Munich in 1889 and to Vienna in 1892. In 1896 he was recalled at the request of the Hungarian government for being involved in the disputes which had arisen with the church authorities. The same year he was created cardinal-archbishop of Ferrara, and in 1903 vice-chancellor of the Catholic Church.

AGLIPAY, Gregorio, archbishop and head of the Independent Catholic Church of the Philippines: b. about 1864. An Ilocano by birth, he was educated in a Roman Catholic seminary and ordained in Manila about 1890. He was trusted by his superiors and rapidly advanced. At the time of the insurrection he was excommunicated by the church authorities for some irregularity in church order. He then cast his lot with the insurrecto movement, and Aguinaldo made him vicar-general. On 4 April 1899 he "came in" and took the oath of allegiance. In October 1902 he with others formed the Independent Catholic Church of the Philippines. The movement spread rapidly. One million five hundred thousand soon joined it. He recommends the reading of the Bible by his people. Consult H. C. Stuntz, 'The Philippines and the Far East,' to which we are largely indebted.

AGLOSSA, ā-glos'sa (Gr. *a,* priv.; *glossa,* tongue), a group of the order *Anura* (toads and frogs) containing only two living families, the South American *Pipidæ* and the African *Xenopidæ,* and characterized by the lack of any tongue and the union of the eustachian tubes into one opening far back in the palate. The pipa toads and South African plathandlers are typical examples. The group is interesting for its antiquity and primitive relationships.

AGNADELLO, an-ya-del'lo, North Italy, a village 10 miles east of Lodi, near which Louis XII of France completely defeated the Venetians, on 14 May 1509, and the Duke of Vendome gained a victory over Prince Eugene in 1705.

AGNANO, an-yä'no, till 1780, small lake, three miles west of Naples, about 60 feet in depth, and without visible outlet. As it was supposed to cause malaria it has been drained. The surrounding country is volcanic and mountainous. On the right lies the Grotta del Cane, where the carbonic acid is dense enough to kill dogs, and on the left are found the sulphurous vapor baths of San Germano, which are valuable for gout and blood disorders.

AGNES, Saint, a saint who, according to the received account, because she steadfastly refused to marry the son of the prefect of Rome and adhered to her religion in spite of repeated temptations and threats, suffered martyrdom during the persecution of the Christians in the reign of the Emperor Diocletian, 303 A.D. She was first led to the stake, but as the flames did not injure her she was beheaded. Her festival is celebrated on 21 January. Domenichino painted a picture representing her at the moment of her execution.

AGNESI, ä-nyä'sē, **Maria Gaetana,** a learned Italian lady: b. Milan 1718; d. 1799. In her 9th year she was able to speak Latin, in her 11th, Greek; she then studied the Oriental languages, and next geometry and philosophy, mathematics having latterly engaged her chief attention. She was appointed, in 1750, professor of mathematics in the University of Bologna, ultimately taking the veil. Her sister, Maria Theresa, composed several cantatas and three operas.

AGNES OF SORRENTO, a romance by Harriet Beecher Stowe. The scene is laid in central Italy during the papacy of Alexander VI (1492–1503). Agnes is the daughter of a Roman prince who secretly marries and then deserts a girl of humble parentage. The young mother dies of grief, and Elsie, the grandmother, takes Agnes to Sorrento, where she lives by selling oranges in the streets. Her beauty and her purity attract to her many lovers, worthy and unworthy, and involve her in many romantic and dramatic incidents.

AGNEW, Cornelius Rea, American physician: b. New York, 8 Aug. 1830; d. 8 April 1888. Professor of diseases of the eye and ear in New York College of Physicians and Surgeons. He was a graduate of Columbia College, and later studied in Europe; was surgeon-general of the State of New York at the beginning of the Civil War, when he became medical director of the New York State Volunteer Hospital. As member of the United States Sanitary Commission he contributed largely to its success. In 1868 he founded the Brooklyn Eye and Ear Hospital. He was interested in the public schools of New York; became founder of the Columbia College School of Mines, and in 1874 one of the trustees of the college. His writings are chiefly monographs on diseases of the eye and ear.

AGNEW, David Hayes, American surgeon and medical writer: b. 24 Nov. 1818; d. 22 March 1892: for many years professor of surgery at the University of Pennsylvania. He was also the operator in several important cases, notably that of President Garfield. He published 'Practical Anatomy' (1867); 'Anatomy and Its Relation to Medicine and Surgery,' 'Principles and Practice of Surgery' (1878); etc.

AGNO, ag'nō, important river in the northwest part of Luzon, Philippine Islands. It is about 90 miles in length, describing a circuitous course, parallel with a range of coast mountains, and emptying into Lingayen Gulf. The town of Lingayen is at the mouth of the river, which is accessible by railway from Manila.

AGNOSTICISM (Gr. "unknowing"), a school of thought which holds that man can know nothing of ultimate realities, or whether they exist; since, his only means of knowledge being through comparison of phenomena, the absolute could only be cognized by his senses on assuming phenomenal traits, and would then be grasped as a phenomenon and not as absolute, the knowledge of which is therefore a contradiction in terms. We cannot know anything outside our own mental processes and the

existence of other minds; in popular phrase, we cannot get behind the looking-glass. This does not, however, deny the absolute any more than affirm it; and most agnostics (as Clifford, one of the greatest) consider the diversity of phenomena as probably indicating a diversity in their causes. The agnostic position involves refusal to accept "evidences" of the origins of the universe, of unseen powers, of a future life, or in general the metaphysical bases of religion, save as more or less probable inferences. The current idea that it involves rejection of these beliefs, however, is entirely wrong; the agnostic does not admit that either the affirmative or the negative of them can be a subject of knowledge, and regards the atheist as less intellectually respectable than the devotee. In point of fact, Professor Huxley, the inventor of the term, thought the existence of beings higher than man rather probable than otherwise, and the government of the universe by a "divine syndicate" of great spiritual essences quite logical. The theory is practically that of the Pyrrhonist or Skeptical school of Greek philosophers. See EPISTOMOLOGY; HUXLEY, THOMAS HENRY; SPENCER, HERBERT. Consult Stephen, Sir Leslie, 'An Agnostic's Apology' (New York 1903); Ward, James, 'Naturalism and Agnosticism' (London 1899); Ormond, A. T., 'Foundations of Knowledge' (New York 1901); Hyslop, J. H., 'Problems of Philosophy' (New York 1905).

AGONY COLUMN, a jocular name given to the column in newspapers set aside for advertisements of missing or runaway persons, lost property, help appeals, etc. Some of these are often couched in agonizing terms.

AG'ORAC'RITUS, Greek sculptor: b. Paros in the 5th century; the favorite pupil of Phidias. His chief work, by some attributed to his master, was the colossal statue of Nemesis at Rhamnus, the head of which is in the British Museum and fragments of the pedestal reliefs in the Athens Museum.

AGNUS DEI. See SACRAMENTALS.

AGORAPHOBIA, a type of phobia in which the patient experiences great anxiety and distress when in open spaces, such as an empty theatre, a very large room, an open square, etc. It is but one symptom found among a number of related neurotic signs in many neuroses and phychoneuroses. It is found, however, in its most striking form in that psychoneurotic group known as the Compulsion Neurosis (q.v.).

AGOSTA, ą-gō'stą, or **AUGUSTA,** a seaport on the southeast coast of Sicily, in the province of Syracuse. It was a place of some importance before the earthquake of 1693, which buried a third of the inhabitants in its ruins, and at the same time ignited the powder magazine, and blew up the citadel. It was off this port that De Ruyter, the famous Dutch admiral, in command of the united Dutch and Spanish fleet, 22 April 1676, was defeated by the French under Duquesne, and received his death wound. Pop. about 16,400.

AGOULT, ą'goo, **Marie Catherine Sophie de Flavigny, Comtesse d',** French author: b. Frankfort-on-Main, 31 Dec. 1805; d. Paris, 5 March 1876; best known under her pseudonym "Daniel Stern." In 1827 she married Comte Charles d'Agoult, but separated from him to live with Franz Liszt who was the father of her three children; a son who died young, and two daughters Blandine, who became Mme. Emile Ollivier. and Cosima who married Hans von Bülow and later Richard Wagner. She is the "Arabella" in the 'Lettres d'un voyageur' of "George Sand" with whom she frequently associated during her European travels. Under the royal régime of Louis Philippe, she was associated with the literary and artistic side of Parisian life; after the revolution of 1848 with its political life. Her best known work is 'Esquisses morales et politiques' (1849); other works include 'Lettres republicaines' (1848), on the government of Louis Philippe; 'Histoire de la Revolution de 1848' (3 vols., 1850–53): the novels 'Herve' (1841), and 'Nélida' (1845) describing her rupture with Liszt; 'Jeanne d'Arc,' a national drama (1857); and 'Mes Souvenirs, 1806–1833' (1877). Consult Rochelaure, S., 'Une amitié romanesque: George Sand et Mme d'Agoult' (Paris 1895).

AGOUTI, ä-goo'te, **AGOUTY** or **AGUTI,** South American and West Indian rabbit-like rodents of the Dasyprocta family and genus *Caviidæ*. They are nocturnal woodland prowlers feeding on nuts, fruits and roots and frequenting sugar cane and banana plantations, where with grunting enjoyment they frequently do considerable damage. Squirrel-like in shape, from 15 to 20 inches long, with slender limbs, five front and three hind toes, and short nails, they hide in the day in the hollows of trees and in burrows among the roots. There are a dozen species of which the West Indian variety, black and brownish with yellow hind quarters, and Azara's "acuchi" of Guiana, are the best known. In Brazil and southward to Patagonia, the "pampas hare," "cavy" or "agouti" is hunted as game.

AGRA, ä'gra, India, a city in the Northwest Provinces, on the right bank of the Jumna, 841 miles by rail from Calcutta. It is a well-built and handsome town and has various interesting structures, among which are the imperial palace, a mass of buildings erected by several emperors; the Moti Masjid or Pearl Mosque (both within the old and extensive fort); the mosque called the Jama Masjid (a cenotaph of white marble); and above all, the Taj Mahal, a mausoleum of the 17th century, built by the Emperor Shah Jehan to his favorite queen, of white marble, adorned throughout with exquisite mosaics. There are several Protestant and Roman Catholic churches, a government college and three other colleges or high schools, besides a medical college. Agra has a trade in grain, sugar, etc., and some manufactures, including beautiful inlaid mosaics. It was founded in 1566 by the Emperor Akbar, and was a residence of the following emperors for over a century. Pop. 185,500.

AGRAM, ä'gram, Austria-Hungary, capital of the crownland of Croatia-Slavonia, between the banks of the Save and the foothills of the Agram Mountains rising in the background to 3,400 feet, 188 miles by rail south of Vienna. Of Roman origin, Agram was made the see of a bishop in 1094. It was ravaged by the Mongol-Tartars in 1242, but after their expulsion it was rebuilt and created a royal free city. It was made the capital of Croatia-Slavonia in 1867 and is an important Slavic

national centre. Earthquakes in 1880 and in 1901 did considerable damage. Divided into the Kapitel-Stadt or Bishop's town, and the upper and lower towns, the city has numerous fine buildings, including the archiepiscopal cathedral of the 15th century, the governor's palace, the Academy of Sciences. the Franz-Josef University and the national theatre. Street railways connect the different districts. An active trade is carried on in wine, grain, silk, porcelain, etc., and there are thriving manufactures of cannons, ammunitions, carpets, tobacco, leather, linen, etc., besides important state railroad works. Pop. 80,000.

AGRAPHA, ăg'rą fa, signifying "unwritten," sayings not recorded in the New Testament, but found in the MSS. of early Christian writers, and ascribed to Jesus. J. G. Körner first used the term in 1776, but its general adoption dates from 1889, when Alfred Resch used 'Agrapha' for the title of his work on the 'Sayings' in Gebhärdt and Harnack's 'Texte und Untersuchungen.' Among early debated examples of the sayings are: "That which is weak shall be saved by that which is strong"; "Wrath destroyeth even wise men"; "A man is unapproved if he be untempted"; and "Jesus on whom be peace, has said: The world is merely a bridge; you are to pass over it, and not to build your dwellings upon it," this last found inscribed in Arabic on the gateway of a mosque at Fatehpur Sikri, by Rev. Alexander Duff, missionary to India, 1829 to 1849. The most important of the sayings are those found in 1897 and 1903 by Grenfell and Hunt at Bahnasa, ancient 'Oxyrhyncus' in Egypt, all beginning "Jesus saith." Among these are: "Jesus saith, Except you fast to the world, you shall in no wise find the Kingdom of God"; "Jesus saith, I stood in the midst of the world, and in the flesh was I seen of them, and I found all men drunken and none found I athirst among them, and my soul grieved over the sons of men, because they are blind in their heart, and see not"; "Jesus saith, Wherever there are two they are not without God, and wherever there is one alone, I say I am with him. Raise the stone, and there thou shalt find me; cleave the wood and there am I." Besides Resch's work consult also Grenfell, B. P., and Hunt, A. S., 'Logia Jesu: Sayings of Our Lord from an Early Greek Papyrus' (London 1897); 'New Sayings of Jesus and Fragment of a Lost Gospel from Oxyrhyncus' (London 1904); Pick, B., 'Paralipomena. Remains of Gospels and Sayings of Christ' (Chicago 1908).

AGRARIAN LAWS, enactments framed at different times by the Romans to regulate the public domain. In the first epoch of the growth of Rome, before the city had extended beyond the Palatine Hill, the whole soil of the state was undivided public property, and from the state, consisting exclusively of citizens, every citizen received a share for his private use. In principle all the land was therefore undivided public property, and the citizen could only acquire possession as tenant at will of the state. In course of time, however, the descendants of the original founders, or the patricians, transformed these primitive concessions into an absolute right called in the Roman law *de jure quiritio*. During the entire existence of the republic the principle was recognized that all lands and personal property acquired by conquest were acquired for the state, and could only become the property of individuals through the cession to them of the rights of the state. As conquest increased the public property, and the class of plebeians was formed, the Roman government gave them an interest in the public domain as private property on condition of their paying a tribute and undertaking other public services. The patricians, however, always preserved their ancient right of receiving in possession and using portions of the public property on paying to the public treasury a tithe of its product. From the earliest period of Roman history lands thus held could pass as an inheritance to children, and were even sold under this uncertain tenure, while the state always reserved the power to resume possession. Spurius Cassius, a patrician, on becoming consul in the early period of the republic, caused a law to be enacted that some portion of the public lands, long before conquered, but occupied by the Roman nobles, shall be surrendered to the state and assigned to the needy citizens. The law remained a dead letter because of the resistance of the patricians, who not only prevented any new divisions of the public lands, but by violence or usury acquired those of the plebeians. The keeping of large flocks of cattle practically ruined the common pasture lands, and in fact excluded the small farmers from them. This caused the publication, in 367 B.C., of the Licinian law, so called from Licinius Stoto, its originator. For a brief period this law was put in force, after which it was neglected for nearly 200 years, when it was renewed by Tiberius Gracchus with some additions and modifications in favor of the patricians. The attempt to execute these laws caused the death of the two Gracchi (133 and 121 B.C.). Not one of the Agrarian laws was ever executed, and it is said by the ablest writers that they had none of that leveling and confiscatory character which has been so often attributed to them. It is believed by able writers that none of the laws aimed at the equal division of real estate owned by individuals in their own absolute right, or intended any limitation upon the ownership of land. The most prominent advocates of the Agrarian laws, Cassius, Licinius and the Gracchi, all belonged to the class which would have been injured by their operation had they led to an undue interference with the right of private property.

AGRARIAN PARTY, a political organization in Germany, representing the interests of the landlords (in political life). The first steps toward the formation of the party were taken by an assembly called together at Breslau, in May 1869, by M. A. Niendorf (d. 1878), and Elsner von Gronow, but the theory on which the party was based had already been formulated by Johann Karl Rodbertus. The organ of the party was *Die Deutsche Landeszeitung*, edited by Niendorf. In February 1876 a constitutional assembly of agrarian reformers was opened, and adopted the official name of "Steuer und Wirtschaftreformer." Their program was especially devoted to the abolition of taxes on land, buildings and trades. At first especial emphasis was laid on free trade, but this object fell more and more into the back-

ground after 1879. Since that date they have sought to limit the importation of food stuffs, and have opposed several commercial treaties supported by the government; they have also opposed the Emperor's project for a canal system, and have been hostile to his navy policy. As the Agrarians dominate the Conservatives in the Reichstag they have frequently obtained important concessions in commercial matters and forced the government to turn to the Radicals for support for its measures.

AGRAVIADOS. The Catalan insurgents in 1825 called themselves by this name, or men with a grievance.

AGREDA, ą-grā'dą, Maria (Coronel) de, Spanish abbess and author: b. 2 April 1602; d. 24 May 1665. Extremely devotional from an early age, she entered a convent at Greda when 17 years old, under the name of Sor (Sister) Maria de Jesus, and eight years later was appointed abbess. Her prominence is due to her posthumously published writings, chief of which is 'La mistica ciudad de Dios, historia divina de la Virgen, Madre de Dios,' (The mystic city of God, the divine history of the Virgin, mother of God), printed in Madrid in 1670. When translated in French and published at Marseilles in 1697, it created an international controversy which lasted over half a century. Her lengthy correspondence with Philip IV from 1642 to 1655 was printed in Madrid in 1885, and is distinguished by its excellent style and valuable illustrations of contemporary Spanish life.

AGREEMENT, a mutual bargain, contract or covenant. Agreements may be either express or implied. Express agreements are those openly stated and avowed by the parties at the time of their making. Implied agreements are those which the law supposes the parties to have made although the terms were not openly expressed. There must be an agreement by the parties, a definite offer made by one party and accepted by the other, and they must assent to the same thing in the same sense. The assent must be mutual and obligatory and there must be a request on one side and an assent on the other. The assent must be broad enough to cover the whole proposition. It must be exactly equal to its extent and provision, and it must not qualify them by any new matter, and even a slight qualification destroys the assent. The agreement must be based upon a sufficient consideration (q.v.), and as against third persons this consideration must be good or valuable. It need not be adequate provided it has some real value. If the consideration is impossible, or illegal either in whole or in part, the agreement will be void. The agreement may be to do anything permitted by the law, as to sell and buy real estate or personal property. The evidence of the sale of real estate, however, must be by deed, and sealed. In many instances agreements in regard to personal property must be reduced to writing.

A hire-purchase agreement is a contract, usually in writing, by which one agrees to hire or purchase goods on instalments, the title to the same remaining in the lender or vendor until the last instalment has been paid, and in case of default in any payment or breach of any part of the contract by the hirer or vendee, the prior payments are forfeited to the lender or vendor. It is virtually a conditional sale, and has become of increasing importance during recent years. See CONTRACTS; SALE.

AGREEMENT OF THE PEOPLE, The, a document proclaimed by the Council of the Army, 15 Jan. 1649, a fortnight before the execution of Charles I of England. It is based on the Heads of the Proposals offered by the Army, 1 Aug. 1647, except that no reference is made to royalty. It is, in fact, the rough draft of a constitution for a republic. It provided that the existing Parliament was to be dissolved before 1 April 1649, after which a "representative assembly," composed of not more than 400 members, was to be elected by the people every two years on the first Thursday in May. The franchise was conferred on all who were "assessed ordinarily toward the relief of the poor," over 21 years of age, and housekeepers "dwelling within the division for which the election is held." There was also to be a "Council of State" for the management of public affairs. Christianity was adopted as the religion "recommended as the public confession," but "Papists" were excluded. To the assembly was given "the supreme trust in order to the preservation and government of the whole," but six points were reserved from its legislative action. Except for the constitutions of the Connecticut and New Haven colonies this is the first record of a republican constitution. But as its promulgators, the Levelers, were defeated by Cromwell, it was never put into effect. A full text of this remarkable document may be found in Gardiner's 'Constitutional Documents' (Oxford 1889).

AGRICOLA, Gnæus Julius, lived from A.D. 37 to 93, and was a Roman general and governor in Britain, the greater part of which he brought under the dominion of Rome. His life (which extended through the reigns of the nine emperors from Caligula to Domitian) has been excellently written by his son-in-law, Tacitus, who holds him up as an example of virtue. Agricola was born at Forum Julii (now Fréjus in Provence), and was the son of Julius Græcinus, a senator put to death under Caligula. He served his first campaign in Britain in 60, and after serving in Asia Minor and again in Britain, and governing Aquitania a prætor for three years, he was raised to the consulship in 77, and the next year went to Britain as governor. Agricola was the twelfth Roman general who had been in Britain, but was the only one who effectually subdued it; partly by his consummate military skill, partly by his policy in reconciling the Britons to the Roman yoke and by teaching them the arts and luxuries of civilization. In his fourth campaign he built a chain of forts between the Forth and Clyde to help to keep in check the peoples to the north of this. His seventh and last campaign (A.D. 84) was marked by the total defeat of the Caledonians under Calgacus, at some place called by Tacitus *Mons Grampius* or *Graupius*. In this campaign his fleet sailed northward from the coast of Fife round Britain to the Trutulensian harbor (supposed to be Sandwich), thus for the first time proving that the country was an island. His death was either caused or hastened by the minions of the jealous tyrant Domitian.

AGRICOLA, Gnæus Julius, Life of. The story of Agricola's life is told by his son-in-law, the historian Tacitus, in what is, perhaps, the most artistic biography that has come down to us from ancient times. It was avowedly written to do honor to its subject, and is in no sense a critical estimate of his character and achievements. The state had fallen on evil days. Was it possible for men to be great even under bad rulers? The question has often arisen in the history of the world, and has been variously answered by honest men. Tacitus was himself convinced that political martyrdom is inexpedient unless the resultant gain to one's country is beyond doubt. "Conformity and moderation," he holds (Agr. 42) "if combined with diligence and energy, attain those same heights of glory to which very many have climbed by perilous paths, gaining fame, without any benefit to their country, by an ostentatious death." It is in this spirit that he describes the career of an upright and highly efficient public servant who knew when it was prudent to avoid futile opposition to the inevitable, and who did his duty unobtrusively under a tyrant in the hope of the accession presently of a better ruler. The style in which this memoir is written represents an early stage of that unique manner which is associated with the name of Tacitus. There is already a tendency to compress the thought, sometimes to the point of obscurity, a preference for short independent sentences rather than the intricately balanced period, a readiness to modify almost any accepted rule of prose structure, and a remarkable mastery of pointed phrase. A very famous specimen of this last power occurs in the speech of the Caledonian chieftain, Calgacus, before the battle at the Graupian Mount: "To robbery, murder, pillage, they (i. e., the Romans) give the false name of empire, and when they make a solitude, they call it peace." The 'Agricola' has been often translated. One admirable rendering is by W. H. Fyfe (Oxford 1908). For an illuminating discussion of the ideas of Tacitus consult Gaston Boissier, 'Tacitus and Other Roman Studies' (New York 1906).

NELSON G. MCCREA,
Anthon Professor of the Latin Language and Literature, Columbia University.

AGRICOLA, Georg, German scholar by the name of GEORG BAUER, better known under its Latin version: b. Glauchau, Saxony, 24 March 1494; d. Chemnitz, Saxony, 21 Nov. 1555. He began his studies in the University of Leipzig in 1514, from which he graduated in 1517 with the degree of B.A. During the next two years he was first vice-principal, then principal, of the Municipal School at Zwickau. In 1524 he began a two years' study of medicine, philosophy and natural sciences at various universities in Italy. In 1527 he was appointed town physician at Joachimstal, Bohemia. Three years later he resigned this position to travel. After another three years of wandering he accepted the position of city physician at Chemnitz, where he remained until his death. Soon after he began writing and publishing the books which made him famous. Of these the most noteworthy is 'De Re Metallica,' consisting of 12 volumes, covering mining, metallurgy and geology, was completed in 1850 and went to press three years later. Originally written in Latin, it was later translated into German, Italian and English, the latter version being published in 1912, in the *Mining Magazine* of London. This work was for 180 years the standard guide of all metallurgists, until the publication of Schluter's work in 1738. It is the first work of this nature based on actual research and experimental work, instead of the imaginative speculations of the alchemists. In 1546 appeared 'De Natura Fossilium,' which ranks almost as high as 'De Re Metallica.' This work comprised 10 volumes on mineralogy and is the first attempt at systematic classification. 'De Ortu et Causis Subterraneorum' appeared in 1546 and includes five volumes on geology. In 1530 he published 'Bermannus,' his first work on mining. Aside from these, his chief works, he wrote copiously on the same and kindred subjects. In 1546 Agricola, at the request of Duke Maurice, entered public life in a diplomatic and advisory capacity. Though a Catholic himself, he was elected a Burgher by the Protestant electors of Chemnitz, and in the same year was appointed Burghermeister. During the Schmalkaldic war he was sent on various missions to Emperor Charles, King Ferdinand of Austria and other potentates.

AGRICOLA, Johann, German reformer: b. 1492; d. 1566. He was one of the most active among those who propagated the doctrines of Luther. He studied at Wittenberg and Leipzig; was afterward rector and preacher in Eisleben, his native city, and in 1526, at the Diet of Spires, was chaplain of the Elector John of Saxony. He subsequently became chaplain to Count Albert of Mansfield, and took a part in the delivery of the Confession of Augsburg, and in the signing of the articles of Schmalkalden. When professor at Wittenberg, whither he went in 1537, he stirred up the Antinomian controversy with Luther and Melanchthon. He afterward lived at Berlin, where he died after a life of controversy. Besides his theological works he composed a work explaining the common German proverbs. Its patriotic spirit, strict morality and pithy style place it among the first German prose compositions of the time, by the side of Luther's translations of the Bible.

AGRICOLA, Martin, German composer and writer: b. Soran, Silesia, 1486; d. 1556. After 1524 and until his death he was musical director of the Protestant school at Magdeburg. He wrote much on musical subjects. His 'Musica Instrumentalis' is invaluable as a source of information in regard to old instruments. It contains many illustrations and explanations of the mechanism and instructions for playing each instrument. It was reprinted by Eitner as volume XX of the publication of the Gesellschaft für Musikforschung. He also wrote 'Rudimenta Musicæ' (1529).

AGRICOLA, Rudolphus, the foremost scholar of the "New Learning," in Germany: b. 23 Aug. 1443, near Groningen, in Friesland; d. 28 Oct. 1485. His real name, ROELOF HUYSMANN (husbandman), he Latinized into Agricola; and from his native place he was also called Frisius, or Rudolf of Groningen. From Groningen he passed to Louvain, then to Paris and then to Italy, where, during the years 1473–80, he attended the lectures of

the most celebrated men of his age, and where he entered into a close friendship with Dalberg, afterward bishop of Worms. On his return home he endeavored, in connection with several of his former codisciples and friends, to promote a taste for literature and eloquence. Several cities of Holland vainly strove with each other to obtain his presence, but not even the brilliant overtures made to him by the Emperor Maximilian, to whose court he had repaired in connection with affairs of the town of Groningen, could induce him to renounce his independence. At length yielding (1483) to the solicitations of Dalberg, he established himself in the Palatinate, where he sojourned alternately at Heidelberg and Worms, dividing his time between private studies and public lectures, and enjoying high popularity. He distinguished himself also as a musician and painter. With Dalberg he revisited Italy (1484), and shortly after his return died at Heidelberg. Most of his works were collected by Alard of Amsterdam (2 vols., Cologne 1539).

AGRICOLITE, a mineral having the same composition as eulytite, but crystallizing in the monoclinic system. It also occurs in globular forms, with a radiated structure, and the crystals, when they occur, are indistinct. The species needs further examination.

AGRICULTURAL ANT, a remarkable species of ant (*Myrmica molefaciens*) that cultivates fields of grass around its hill, allowing only one kind of grass (*Aristida*) to grow in a field; it harvests the seeds and stores them away as food. The fields may be as large as 15 feet across; roads are laid out from the hill to the outer margin of the plantation, so that the crop may not be trampled, and any weeds which appear among the grass blades are at once cut off. These colonies are often found in large grain fields, which they injure in proportion to their numbers.

AGRICULTURAL ASSOCIATION, the voluntary association of farmers with the object of promoting a knowledge of the science of agriculture. The first instance on record of such an organization is that of the Society of Improvers in the Knowledge of Agriculture, founded in 1723 by a group of Scotch agriculturalists. It continued its activities for over 20 years and has left behind its 'Select Transactions,' published in 1743. In 1777 the "Bath and West of England Society" was established, followed by the "Highland Society" in 1784. The later organization exists to this day as the "Highland and Agricultural Society of Scotland," carrying on much the same work as the United States Department of Agriculture. In England the same functions in the development of agriculture were performed by "The Royal Agricultural Society," founded in 1838. Its present membership is considerably over 10,000 and at its annual agricultural fairs it distributes as much as $50,000 in prizes. It maintains an experimental station at Woburn and a veterinary college at Camden Town, London. Another organization is the Agricultural Organization Society, Ltd., founded in 1901 to organize agricultural co-operative societies in England and Wales. It has affiliated with it about 400 societies and its membership includes over 20,000 individuals. In Ireland a society of the same name and the same purposes has been very active of recent years, under the guidance of Sir Horace Plunkett, who by some has been termed the father of modern Irish agriculture.

In the United States the activity of the Department of Agriculture has made the extensive organization of such societies needless, but in 1785, before there was any thought of the government taking over such work, a society for the promotion of agriculture was founded in Philadelphia. In the same year another society of the same nature was organized in South Carolina. Then followed other societies in Kennebec, Me. (1787), New York city (1791) and the Massachusetts Society for the Promotion of Agriculture (1792). By 1809 these societies attempted the beginnings of a national federation, whose work should be of nation-wide scope, in the Columbian Agricultural Society, with headquarters in Washington, D. C. The holding of agricultural shows or county fairs had its origin in Washington, in the efforts of Elkanah Watson, of Massachusetts. Such exhibitions are now held all over the country by nearly 3,000 organizations, ranging from international to local scope in their characters. In many of the States agricultural societies have developed to large proportions. Other societies have for their purpose the organization of co-operative buying and selling among farmers. But in 1913 the Department of Agriculture assumed a function approaching this very much in character — the rural organization service to assist farmers in forming organizations for the betterment of agricultural and country life.

AGRICULTURAL CHEMISTRY. Agricultural chemistry deals with the chemical composition of plants and of animals and of their foods, and with the chemical changes involved in the life processes. It therefore includes the chemistry of air, water, soil, manures, fertilizers, insecticides, fungicides, plants, animals and metabolism or the chemical changes taking place in living things. Some of the problems of agricultural chemistry do not lie strictly in the field of chemistry but border on other branches of science such as physics, geology and physiology.

Composition of Plants. — The number of definite chemical compounds occurring in plants is very large, and excluding water which may constitute from 75 to 90 per cent of the weight of the plant, most of them can be classified under one of the following heads:

INORGANIC SALTS.	
ORGANIC COMPOUNDS WITHOUT NITROGEN.	carbohydrates. fats and waxes. essential oils, terpenes and resins. organic acids.
ORGANIC COMPOUNDS CONTAINING NITROGEN.	proteins and amino acids. amides. alkaloids. chlorophyl and coloring matter.

Carbohydrates, including cellulose, starch and sugars, or fats or proteins make up most of the dry matter of plants. Except for certain terpenes which contain only carbon and hydrogen the organic compounds all contain carbon, hydrogen and oxygen, and some also contain nitrogen. Sulphur occurs mainly in one of the amino acids which are the constituents of proteins. Phosphorus occurs in conjugated proteins and also as inorganic and organic

phosphates. Potassium and calcium are present as salts of inorganic and of organic acids. Iron, magnesium and manganese occur in organic combination, magnesium being present in the green pigment chlorophyl. Sodium, chlorine and silicon are also found in most plants, but they do not seem to be essential to plant life.

The Air.— The growth of plants is greatly influenced by temperature and rainfall, both of which are controlled by the atmosphere. The nitrogen of the air is one of the elements essential for plant and animal life, but it can be utilized only when it is in combination with other elements. Except for a small amount which is combined with oxygen during lightning discharges and brought to the earth by the rain, and that which is now artificially fixed by chemical processes and added to the soil in commercial fertilizers, all nitrogen that is used by plants has been fixed or combined with other elements by micro-organisms which are present in fertile soils and especially in the nodules on the roots of leguminous plants, or by certain very low forms of plant life. The nitrogen is then taken from the soil by the roots of the plant in the form of nitrates. The oxygen of the air oxidizes organic matter in the life processes to furnish energy and also oxidizes waste matter during decomposition. The main products of complete oxidation are carbon dioxide and water. The source of all the carbon in organic compounds in plants is, with few exceptions, the carbon dioxide of the air. In the presence of chlorophyl, the green pigment of plants, and under the influence of light, carbon dioxide and water are converted into organic compounds which occur in plants. During this process a volume of oxygen equal to the volume of the carbon dioxide is returned to the aid.

The Soil.— Plants obtain from the soil, in addition to nitrogen which comes originally from the air, water and inorganic salts containing phosphorus, sulphur, potassium, calcium, magnesium, iron and manganese. Soil is formed by the disintegration of the rocks which make up the earth's crust, mostly by the mechanical and chemical action of water and air, and the elements necessary for plant food are made available by chemical decomposition of the mineral compounds of which the rocks are composed. The soil then consists of decomposed rocks, mainly in the form of sand, clay and limestone with small amounts of unchanged minerals and of the salts necessary for the growth of plants. In addition to these, an important constituent of fertile soil is humus, which is decaying organic matter, either of plant or animal origin. Humus benefits the soil both on account of its physical and its chemical properties. It contains the elements required by plants, which are made available for plant food during decomposition, and it is able to retain ammonia and some other bases, thus preventing their loss from the soil by leaching. It has a lower density, a higher specific heat and a greater capacity for holding water than the other constituents of soil, thus making a moist warm soil in which the air can circulate. These conditions are most satisfactory not only for the growth of plants but also for the action of nitrifying bacteria which oxidize different forms of nitrogen into nitrates which can be utilized by plants. When the air is excluded from the soil either because the soil is too compact or because it is not well drained, the conditions are more favorable for the action of denitrifying bacteria which reduce nitrogen compounds to free nitrogen which is then lost as a plant food. An important property of fertile soils is the ability to retain plant food by forming insoluble compounds which are not washed out by water but which are soluble in the plant juices. In addition to the retention of ammonia by humus, which is mentioned above, phosphates, potash and ammonia are retained by clay, the phosphates in combination with oxides of iron and aluminum, the bases in combination with complex silicates.

Manures.— Soils gradually become poorer in plant food as crops are removed every year. If the crops removed are fed to farm animals and the manure returned to the land the soil may be maintained in a fertile condition. The manure from an adult animal not giving milk contains practically all the nitrogen, potassium, phosphorus and calcium that was present in the food, but growing animals and those giving milk use a certain amount of these elements, so the amount in the manure is generally about 80 per cent of that in the food. On a farm where milk is the only product sold and where some feed is bought for the animals the manure will return to the soil all that the crops take from it, providing the manure is used in such a way that nothing is lost from it by fermentation or leaching. In addition to returning plant food to the soil manure furnishes humus and so greatly improves the physical condition of most soils. This beneficial effect is lasting, so that the soil remains fertile for several years after the application of manure.

The condition of a soil is improved by green manure as well as by farm manure, especially when the latter is not obtainable. It has been known for ages that the growth of leguminous crops such as red clover is to a great extent equivalent to the application of nitrogen fertilizers for the growth of cereals, and in 1886 Hellriegel and Wilfarth demonstrated that this was due to the fact that micro-organisms in the nodules on the roots of leguminous plants assimilate free nitrogen from the air and make it available for plant food. Growing and plowing in leguminous crops therefore not only returns to the soil the plant food used by the crop but it also increases the supply of combined nitrogen in the soil.

Commercial Fertilizers.— When crops are continually taken from the soil and plant food is not returned in manure, it is necessary to supply the necessary elements in commercial fertilizers. These are used mainly to supply nitrogen, phosphorus, potash and lime, as the other elements are required in such small amounts that most soils have a sufficient supply. The principal nitrogen fertilizers are either organic matter such as dried blood, meat waste, fish scrap, tankage, sewage sludge and cotton-seed meal, or inorganic compounds including ammonium sulphate recovered from coal gas, nitrates from the natural deposits in Chile, and artificially fixed nitrogen in the form of calcium nitrate, ammonium sulphate and calcium cyanimide. Nitrogen is assimilated by plants in the form of nitrates, so the nitrate salts are most readily available for plant growth, but in fertile soils there are bacteria to ammonify

organic nitrogen and to nitrify ammonia. Some kinds of organic matter such as leather and wool waste decompose very slowly and so the nitrogen is not readily available.

The phosphate fertilizers are phosphate rock, bones, superphosphate and basic slag. The first two are insoluble, consisting mostly of tricalcium phosphate, and it was Liebig who in 1840 first suggested making a more soluble product by treatment with sulphuric acid to make superphosphates which consist of monocalcium phosphate and calcium sulphate. In the last few years some phosphate rock has been treated in the electric furnace to get a soluble concentrated product which may be used either in combination with ammonia, potash or lime. Basic slag contains the phosphorus removed from iron by limestone in the blast furnaces.

Except for tobacco stems and wood ashes, most potash fertilizers have been salts from the Stassfurt mines in Germany. Since 1914, when the supply from Germany was cut off, many attempts have been made to obtain potash supplies in this country. Two methods of obtaining large amounts at a reasonable cost appear to be successful. The first is the recovery of potassium salts from the kelp of the Pacific Ocean by processes in which other by-products are also recovered. The second is the recovery of potash from feldspar and clay in connection with the cement industry by the use of the Cottrel process for precipitation from the flue dust. By this method a large amount of potash which has previously gone to waste is now recovered at a slight cost.

Applications of lime are often of benefit on soils which are not deficient in calcium, on account of the effect on the physical condition of the soil and the chemical action on the soil constituents. Lime floculates clay and so improves the drainage of a heavy soil, it liberates potash from feldspar, makes certain phosphates more available for plants and aids bacterial nitrification by neutralizing acidity and maintaining a neutral or slightly alkaline condition. Lime is applied either as quick lime, slaked lime or finely ground limestone.

Crops.— The different fertilizers have different effects on the growth of plants and different crops require different amounts of the plant foods, so commercial fertilizers should not be used indiscriminately. Analyses of plants show how much of each of the necessary plant foods is removed by any crop and this gives an indication of how much fertilizer should be added to the land to keep the soil from becoming deficient in any element. Nitrogen generally tends to delay maturity by causing more growth. Maturity is also delayed by a lack of phosphorus which is especially needed for the growth of the seeds. While potash tends to delay the maturity of grains it hastens the maturity of root crops. While the use of fertilizers may materially increase the yield the composition of the mature crop is influenced very little by the amount or kind of fertilizer used.

On account of the fact that different crops use different amounts of the several plant foods and so deprive the soil of different elements, a plan of crop rotation exhausts the soil less rapidly than growing a single crop continuously on the same land and allows the soil to be enriched occasionally by the growth of a leguminous crops. Some plants have short roots which take their food from the surface soil, while others have long roots which bring up their food from the deep soil and when the crop is harvested and the root decays it enriches the top soil by a certain amount of potassium, phosphorus and nitrogen.

That the climate influences the composition of crops more than other factors has been shown by several experiments. Among them is LeClerc's experiment with wheat in which it was found that the same wheat planted in different parts of this country gave crops with very different amounts of protein and starch, while wheat from different parts of the country when planted in one place gave crops which were approximately alike and quite different from the seed from which they were planted. With regard to the effect of rainfall on the composition of wheat it was found that an abundant water supply produces a large starchy grain, while a dry climate produces smaller grains with a larger proportion of protein. Wiley's experiments with sugar beets showed a considerable variation in the composition of crops grown in different parts of the country from the same seed, a larger yield of sugar being obtained in the northern part of the country. In experiments with sweet corn Wiley found that the climate has less influence on the composition of the crop than the amount and distribution of the rainfall. From such chemical studies it is possible to find out in what part of the country to grow certain crops with the best results and also to select for development the varieties that will produce more of a given desirable constituent, either protein, fat or carbohydrate. It is evident that for the improvement of crops by selection it is necessary that the experiments be carried on in the climate in which the crop is to be grown.

Insecticides and Fungicides.— Plants have many insect enemies and it is often necessary to use poisons to kill them. These poisons must not be such as to harm the plant and must not be used in a way to make it poisonous as a food for the higher animals. The poisons used for spraying on leaves which insects eat are mainly insoluble arsenic compounds such as Paris green and lead arsenate. Among the sprays that poison by contact are lime sulphur and tobacco extract or nicotine solution. For destroying insects in stored grains poisonous gases are frequently used, such as hydrocyanic acid and carbon disulphide. Copper salts are commonly used for destroying fungi and the most generally used fungicide is Bordeaux mixture which is made from copper sulphate and lime.

Animals.— The animal body contains besides from 50 to 70 per cent of water, inorganic salts and organic matter which is mainly protein and fat. The inorganic salts include phosphates and chlorides of calcium, sodium, potassium and magnesium in the skeleton and body fluids. The organic matter includes compounds containing carbon, hydrogen, oxygen, nitrogen, sulphur, phosphorus, iron and iodine. Small amounts of fluorin and silicon are also found but it is not known that these are essential to animal life. The organic matter required by animals comes directly or indirectly from plants which have synthesized their organic compounds from the inorganic matter in the

air and soil. The organic matter required for growth and repair of tissues is protein, and the energy required for keeping the animal warm and for performing the functions of the organs and muscles is obtained by oxidation of organic compounds, mainly fat and carbohydrate. Protein in excess of that required for building new tissue or replacing waste tissue is also used as a source of energy, but protein foods are a more expensive source of energy than fat or carbohydrate, and they are generally used in a diet only in amounts necessary for tissue-building. Any excess of food over that required for growth and for energy is stored as fat. Not only must a diet contain protein, fat, and carbohydrates enough to furnish the necessary energy, but it must have a sufficient variety and amount of inorganic salts, and there are also certain other organic compounds, known as accessories or vitamines, which are present in small amounts in food from plant and animal sources and without which animals either do not grow or they develop certain diseases such as polyneuritis or scurvy, which are therefore known as deficiency diseases.

Energy requirements of animals have been carefully investigated by three methods: First, by determining the balance between the intake of energy in the food and the output in the excrement; second, by observing the amount of oxygen consumed during respiration and the amount of carbon dioxide exhaled; third, by direct measurement of the heat given off by the body in a calorimeter. The three methods are combined in experiments made with the respiration calorimeter devised by Atwater. By these means feeding standards have been established, especially by Armsby, for different animals under different conditions such as growing, working, fattening and giving milk.

Besides the importance of the required amount of different food substances it is now known that the quality of the protein has some effect on its availability for animal use. Work by Osborn has shown that some proteins do not furnish nitrogen in a form that can be used by growing or adult animals. Analyses of these proteins show them to be deficient in certain ones of the amino acids of which proteins are composed.

Carbon and Nitrogen Cycles.— The study of agricultural chemistry shows interesting cycles for carbon and nitrogen. Carbon is taken from the air as carbon dioxide by plants and synthesized into organic compounds which are then used by animals and returned to the air by oxidation during respiration or decomposition. Some carbon is returned to the air by plants by oxidation during respiration or decomposition or combustion, and there are other branches to the cycle, but in the main it may be represented as air — plant — animal — air — plant — animal, etc.

In the same way combined nitrogen as nitrates is taken from the soil by plants and synthesized into organic compounds which are then used by animals and returned to the soil in manure or the dead body. Here also some of the nitrogen is returned to the soil by decaying plants, but the main cycle is soil — plant — animal — soil — plant — animal, etc.

Dairy Chemistry.— Dairying is an important agricultural industry not only commercially but also because dairy farming tends to keep the soil fertile by returning to it all the plant food taken from it except for the small amount used in producing the milk. Chemical investigations have been directed to the composition and character of milk from different cattle and under different conditions, to the chemical changes taking place during souring and curdling, to the processes of making butter and cheese and to the effect of pasteurization on the composition of milk.

Organizations.— Every State in the country now has an agricultural college or an agricultural station where experiments in agricultural chemistry are carried on, and the United States Department of Agriculture is investigating many of the problems in this field. The Association of Official Agricultural Chemists, organized in 1880, is composed of the Federal and State officials who are enforcing the laws regarding foods, drugs, feeding stuffs, fertilizers, insecticides and fungicides, and those who are carrying on investigations along these lines under the Federal or State governments. The main work of this association is the improvement of the methods of analysis of agricultural products and it meets annually to report the results of collaborative work carried out on these methods. Its analytical methods are official in many of the Federal and State laws. The proceedings of the meetings and the methods of analysis are published in the *Journal of the Association of Official Agricultural Chemists.*

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H. E. Woodward,
Bureau of Chemistry, Department of Agriculture, Washington, D. C.

AGRICULTURAL COLLEGES. As a result of National and State co-operation, which enables the ordinary farmer to profit from the experiments of widely separated individuals interested in scientific farming, the United States stands foremost in the matter of agricultural development. As far back as 1862 Congress passed the first of a series of acts whereby extensive grants of national lands were made and converted into trust funds for the support of at least one agricultural college in each State, the grants being contingent upon a certain percentage of assistance by the States. Our Department of Agriculture renders the greatest

service imaginable to the country; but its facilities are greatly improved by the co-operation of the different State agricultural institutions, while the farmers of each section can rely upon their special State colleges to supplement the work of the national institution.

The Massachusetts Agricultural College is one of the foremost representatives of the typical institution devoted to practical agricultural education, and its work and studies are devoted chiefly to the training of students in modern scientific farming. The work is conducted in the class-room, on an experimental farm and in co-operation with farmers' organizations. The institution is located on a farm of 400 acres at Amherst, and its buildings, land and equipment are valued at $1,530,465. Its annual income from the State and United States for extension work and its experiment station alone amounts to $100,000. There are buildings for nearly every imaginable specialty pertaining to agriculture — a chemical laboratory, botanical laboratory, plant-house, creamery and dairy laboratory, veterinary buildings, barns, museum, library, and entomological laboratory and insectary.

Instruction is given by a corps of 60 professors and assistants in chemistry, botany, agriculture, horticulture, zoology, veterinary science, mathematics, civil engineering and similar studies and in extension work. Practical work on the farm is a part of the course, and the students cultivate the whole farm, experimental orchard and nursery. There are 100 acres devoted to orchards, vineyards and the cultivation of small fruits; 150 acres under cultivation with field crops and nearly as many more allotted to grass and hay for the cattle which are kept on the farm. Considerably over 1,000 men have been educated at the Massachusetts Agricultural College. A recent census of them showed that nearly 400 are to-day engaged in agricultural pursuits; more than a score are instructors in other similar institutions; and others have drifted into a variety of callings. The effect of the college on the agriculture of the country must prove of immeasurable value if a similar proportion of its graduates adopt farming for their life's work, and perform their labors in a scientific manner, as they were taught to do at the institution. During 1915 a new building, costing $210,000, was dedicated.

The State agricultural and mechanical colleges which have sprung up in most of the leading agricultural States of the East and West, and in many parts of the South, in recent years, have in view the training of young men for scientific and practical agriculture, and also for mechanical and manufacturing arts and sciences. They are endowed by the State and the Federal Government (see DEPARTMENT OF AGRICULTURE) and also by private individuals. They are for the most part under the control of the State Board of Agriculture, the governor and other State officers; but the president and faculty of each institution practically have all the liberty they demand in carrying out the work according to well-defined policies. Some of these State agricultural colleges are remarkably well equipped and endowed for the work they have in hand. Thus, the Iowa State College of Agriculture has 15 buildings, which have been erected by the State at a total cost of $500,000. There are nearly 1,000 acres of land attached to the institution. A corps of 250 professors and instructors and over 1,700 students are engaged in study and work. All kinds of crops raised in Iowa are cultivated on the farm, and cattle, horses and poultry are kept by the students. Experiments are constantly being carried on by the professors and students in agriculture, horticulture, chemistry and general farming, and the results of these experiments are published in bulletins and papers for the benefit of the world.

The Pennsylvania State College, called the Agricultural College of Pennsylvania, is even broader in its educational aims than the Iowa college. Almost all studies from agriculture, chemistry, physics, engineering, mining and mathematics up to philosophy, general literature and languages are taught there. In recent years this college has steadily broadened as a high-grade technical, scientific and classical institution. Nevertheless agriculture, in all its wide fields of application, is one of the chief studies emphasized at the college. A correspondence course has in late years been organized for the purpose of instructing students on farms who cannot attend the college, but who wish to avail themselves of the researches and facts obtained at it. Forestry is one of the most useful branches of work carried on at this college; and it not only trains young men to appreciate the value of cultivating orchards and woods, but also turns out practical foresters, capable of taking charge of large forests and converting them into profitable possessions, without destroying and denuding them of trees.

The Michigan State Agricultural College is another institution which, for more than 45 years, has endeavored to help the farmers in their struggle to wrest from the soil a fair compensation for their labors. The original idea of this college was to perfect in their studies all graduates of the common schools who wished to possess a complete practical and theoretic knowledge of the arts and sciences which bore directly upon agricultural and kindred pursuits. Economic zoology, meteorology, physics, veterinary science, entomology, bacteriology, chemistry, geology, and agriculture and horticulture are a few of the studies pursued. Post-graduates can pursue advanced studies in the sciences, and in the library of 38,000 volumes they can find nearly all the literature of value pertaining to their particular studies. There is a fine arboretum, a botanic garden, a grass-garden and a weed-garden, where 100 or more noxious weeds are grown to show their destructive possibilities to the students. There are some 1,400 students at the college, and more than half of them take the full agricultural course.

The South has a good institution of this class in the Mississippi Agricultural and Mechanical College, with a faculty of some 60 members and a student membership of nearly 800. The college is under the management of a board of trustees, with the governor of the State an ex officio member. The students who attend this college are paid eight cents per hour for their work in the fields or orchards, which enables them to pay for a part of their living while studying.

The Kansas State College, with its 300 acres of land, buildings valued at $965,000 and a faculty of 190 professors and assistants, has

become an important factor in the middle West in developing the agricultural possibilities. Agriculture, engineering and general and household economics are taught to the students. There is a dairy, blacksmith-shop, foundry, machine-shop, printing-office, and woodwork and painting shop connected with the college, where practical work can be followed by the students.

With agriculture as our leading industry, many of the large universities have in recent years established an agricultural course and experimental farms for work in the regular college course. When this subject is mentioned, one turns instinctively toward Cornell University, with its admirable agricultural and forestry departments; toward the Ohio State University, with its buildings and equipments aggregating nearly $5,000,000 and with an income of $1,250,000; or toward the University of Wisconsin or the University of California. These typical universities, which have given agriculture and horticulture a prominent place in their curriculums, send forth annually hundreds of students to teach practical farming to new communities which may still labor under the disadvantage of old methods and ideas of agricultural production. The Ohio State University at Columbus has over 2,500 students and a corps of 250 professors and assistants; but it aims to give a scientific and classical education to both young men and women. It is divided into six colleges, with one devoted to agriculture and domestic science and another to veterinary science. Students pursuing other studies can take courses in these departments, and there are also opportunities for graduate studies in the science of agriculture. There is a well-stocked farm connected with the university, a dairy department and a large laboratory for student work.

At the end of 1914 there were 69 State agricultural colleges, some of them being conducted in connection with the State universities. Their total endowments amounted to $60,000,000; the value of their farms amounted to $24,000,000 and their buildings to $51,800,000. Toward their maintenance the Federal Government was contributing $3,592,198 (see *States Relations Service* in article DEPARTMENT OF AGRICULTURE) and the States were contributing $17,997,765. The rest of their incomes, mostly from tuition fees, amounted to $13,301,000. The total number of students enrolled amounted to 115,054. During the four years from 1910 to the beginning of 1915 the increases in their equipment, faculties, student bodies, etc., have amounted to 67 per cent. During the year 1915 progress was especially notable; the State legislature of California appropriated large sums for additions to the group of agricultural buildings at the State University, Nebraska gave $100,000 for similar purposes and Cornell University completed a new Soils Building which cost $100,000.

AGRICULTURAL CREDIT ASSOCIATIONS. See CO-OPERATIVE BANKING; FEDERAL FARM LOAN ACT; LAND CREDIT.

AGRICULTURAL EDUCATION. See EDUCATION, AGRICULTURAL.

AGRICULTURAL EXPERIMENT STATION. An institution for scientific research in agriculture. The modern agricultural experiment station owes its origin chiefly to the work of Boussingault and Liebig, born respectively in 1802 and 1803, although the earlier work of Sir Humphrey Davy, De Saussure and others had prepared the way for that of these great chemists. During the third decade of the century Boussingault established and for a few years maintained a chemical laboratory on his farm, and there began the combination of field experiment with laboratory investigation which characterizes the experiment station of to-day.

In 1837 a young Englishman, John Bennett Lawes (q.v.), began making experiments in the use of bone superphosphate on his ancestral estate at Rothamsted, near St. Albans, Hertfordshire, about 25 miles northeast from London. The success of these experiments led him to engage in the manufacture of superphosphate and also stimulated a desire for further investigation, and after some years of preliminary work, in 1843 he associated with himself Dr. Joseph Henry Gilbert, a young chemist and a recent pupil of Liebig, and the two entered upon a systematic line of research which has been continued without material change of original plan until the present day. For more than half a century these two men worked together; both received the well-earned honor of knighthood, and before his death, which occurred in 1900, Sir John Lawes made provision for the permanent continuance of the work, under what is now known as the "Lawes Agricultural Trust."

The feature of the work of Lawes and Gilbert which distinguished it from anything that had previously been undertaken, except the work of Boussingault, was the combination of systematic and long continued field and feeding experiments with parallel investigations conducted in the chemical laboratory, in which the principal agricultural plants adapted to the English climate were grown both continuously on the same land and in various rotations, the composition of the crops and of the soils upon which they were grown being determined from time to time, and in which large numbers of animals have been fed over long periods and under such conditions that it was possible to determine the chemical elements consumed in the food and the proportion of each utilized by the animal. Extensive detours have also been made into other fields of chemical research, especially that of the assimilation of nitrogen by plants. For many years several general assistants have been employed, including chemists, botanists, computers and other help. The entire expense of this work has been met by the originator, except that a chemical laboratory was presented to him some years ago in recognition of the value of his work.

In 1851 a small company of Saxon farmers, organized as the Agricultural Society of Leipzig, incited by the revelations of Liebig and Boussingault (q.v.), who were then in the full zenith of their work, employed a young chemist, Emil von Wolff, and started him in the experimental study of agricultural problems, especially those related to the feeding of animals. In a few years the government was induced to assume the cost of this work, and thus was established at Moeckern, near Leipzig, the first public agricultural experiment station in the world.

In the United States attempts at experimental research in agriculture were undertaken at the Agricultural High School, afterward State College, of Pennsylvania; at the Michigan Agri-

cultural College and at the Maryland Agricultural College, all established between 1854 and 1858, and later several of the institutions organized under the National Agricultural College Act of 2 July 1862 undertook some investigations of this character.

The first regularly organized agricultural experiment station in America was established at Wesleyan University, Middletown, Conn., in 1875, under the directorship of Dr. W. O. Atwater, a young chemist who had become enthused with the idea while studying in Germany. For the inauguration of this work private initiative was necessary; Mr. Orange Judd, then editor and proprietor of the *American Agriculturist,* contributed $1,000 on condition that the State should appropriate $2,800 for the support of the station for two years. This offer was accepted and work was begun in October of that year. In 1877 at the expiration of this period the State assumed the entire support of the station, and it was removed to New Haven.

Similar stations were established by North Carolina in 1877; by New Jersey in 1880; by New York and Ohio in 1882; and by Massachusetts in 1883. During this period also several of the agricultural colleges organized their research work on a more definite basis, and by 1887 there were 17 stations in operation in 14 States.

In 1883 a bill was introduced in the House of Representatives of the National Congress by C. C. Carpenter, of Iowa, providing for the establishment of experiment stations in connection with the colleges of agriculture, but it was not voted upon. In the next Congress Mr. Cullen, of Illinois, introduced a bill providing for a grant of $15,000 annually to each State and Territory for this purpose. This bill was re-introduced in the following Congress by William H. Hatch, of Missouri, and after being so amended as to authorize States, in which experiment stations independent of the agricultural colleges had been previously established, to use the grant in support of such independent stations — a proviso applying to the five stations above mentioned — the bill became a law on 2 March 1887.

Under this law experiment stations have been established in every State and Territory in the United States, 60 such stations being enumerated in 1914 — the fund being divided between two stations each in Connecticut and New York; while additional stations have been established under State or Territorial support in Alabama, Louisiana, Missouri, New Jersey, Pennsylvania and Virginia, and in several of the States substations or test farms have been established under State support, but as adjuncts to the regular stations. In addition to these the National Government has established stations in Alaska, Hawaii, Porto Rico and Guam.

In 1914 the stations organized under the Hatch Act of 1887 and the Adams Act of 1906 (see below) had a total income of $5,054,687.96, of which $1,426,166.99 was received from the National Government, the remainder, $3,628,520.97, coming from State appropriations, fees, sales of produce and other sources. The stations employed 1,852 persons in the work of administration and research, and published 1,330 reports and bulletins, which were sent to over 1,000,000 addresses.

The following are among the principal subjects under investigation by the American stations: (1) The soil: its physics, chemistry and biology; including tillage, drainage, irrigation and the maintenance of fertility by crop rotation and the use of manures and fertilizers. (2) The plant: its physiology, chemistry, nutrition and pathology; the introduction of new varieties; improvement in productiveness by selection and breeding; the control of fungous and bacterial diseases and injurious insects; the various phases of forestry. (3) Animals: the special adaptations of the various breeds; the chemistry of animal foods and the economics of feeding; dairying and its manifold problems; the control of animal diseases.

In addition to the work above outlined, several States have laid upon the stations certain lines of police work, such as the inspection of fertilizers, seeds, drugs, foods and animal feeding stuffs for the prevention of adulteration; that of live stock to prevent communication of animal diseases, and that of orchards and nurseries for the control of insect pests and fungous diseases; but such work is not scientific research; it frequently interferes materially with the conduct of such research, and is more properly an executive function of the State government. In some States it is so recognized.

Under the provisions of the Hatch Act the stations are governed under the laws of their respective States, the National Government exercising no control except to make sure, through annual financial reports from the stations and through personal visits by officers of the Office of Experiment Stations of the Department of Agriculture, that the money appropriated by Congress is being expended for the purpose designated in the national law.

The stations, in connection with the colleges of agriculture, have organized an Association of American Agricultural Colleges and Experiment Stations, which meets annually at some point in the United States for the discussion of matters pertaining to their work, and the Office of Experiment Stations publishes a monthly journal, the *Experiment Station Record,* in which notices or summaries are given, not only of the publications of the American stations, but also of the scientific agricultural publications of the world.

While this work has been thus extending in the United States it has also spread over most of the civilized world, 728 such institutions being enumerated in other countries in a bulletin of the Office of Experiment Stations, published in 1904. The only countries in which experiment stations were not found in that year were Greece, China, Turkey, Russia, Afghanistan, Beluchistan, Mexico, Central America, Bolivia, Colombia, Ecuador, Patagonia, Peru, Uruguay and Venezuela. As was natural, there has been a decrease in the kind of activity which has characterized the European stations in normal times. The information available has been drawn on to a hitherto unprecedented degree. The forces of many of the stations have been drawn for the war and considerably depleted.

The European stations as a rule are confined to single lines of investigation, and very often to inspection work merely, whereas the American station generally embraces several co-ordinate departments, each with a chief and

one or more assistants and helpers, all working under the general supervision of a single director. Many of the European stations would be classed as substations in America. Another point of difference is that elsewhere the stations are very generally limited to laboratory work, whereas in America, England and the English colonies the laboratories are generally used as adjuncts to field investigation.

The rapid extension of this work throughout the world and the large and constantly increasing sums of money devoted to it are sufficient evidence that it has obtained and holds the confidence of the people; but this position has been attained rather through the gradual substitution by the stations' investigations of demonstrated facts for the theories which had previously held sway in agriculture than by epoch-making discoveries, although a few of these also are to be placed to the credit of these institutions.

It was the Rothamsted Station which demonstrated that leguminous plants do not absorb and fix the free nitrogen of the air through their foliage, a demonstration which cleared the way for the solution of a mystery which had puzzled the student of plant growth for many years, and Dr. S. M. Babcock, of the Wisconsin Station, perfected a method of determining the fat in milk, which has been adopted throughout the world, and for which a medal was voted to him by the legislature of his State; but it is the patient, plodding work, by which a body of exact knowledge in agriculture is being slowly accumulated, which has been the chief factor in winning confidence and support.

On 15 Feb. 1906 a bill, introduced by H. C. Adams of Wisconsin, passed the House of Representatives by a unanimous vote, increasing the national allotment to the experiment stations by $5,000 for each State for 1906, this amount to be increased by $2,000 annually until the total should reach $15,000. This bill became a law 16 March and the experiment stations receive $720,000 annually under it in addition to the same amount appropriated under the Hatch Act.

CHARLES E. THORNE,
Director Agricultural Experiment Station, Wooster, Ohio.

AGRICULTURAL IMPLEMENT INDUSTRY, The. One of the largest classified industries of the country, including the establishments whose products of greatest value are machines or implements designed for use in agriculture. Such implements fall naturally into four groups: (1) Implements of cultivation; (2) seeders and planters; (3) harvesting implements; (4) seed separators. The first group includes plows, harrows and cultivators; the second, seeders, drills, planters and listers; the third, mowers and reapers, harvesters and hay rakes, hay tedders, hay forks, hay stackers, etc.; the fourth, threshers, fanning mills, corn huskers and corn shellers. Besides the production of new machinery there is a very large output of parts for replacement or repair of worn-out mechanisms, amounting to some $60,000,000 annually.

The special census of manufactures made for the year 1914 shows that in that year there were 772 establishments engaged wholly or partly in the making of agricultural implements. Their combined product amounted to 3,318,176 implements of cultivation; 634,929 seeders and planters; 1,076,769 harvesting implements; and 140,803 seed separators. Their aggregate value was $160,120,632, which, as compared with the value in 1909 — $149,318,544 — shows an increase of 12.6 per cent in the five years. These totals include a value of $60,211,327 for parts and miscellaneous implements and $1,460,590 received for repairs.

The industry, as might be expected, is widely distributed over the country, every farming community constituting a centre of demand. Of the 772 establishments engaged in the industry in 1914, 86 were located in Illinois, 67 in Ohio, 61 in Wisconsin, 58 in New York, 49 in Pennsylvania, 45 in California, 42 in Indiana, 40 each in Iowa and Michigan, 35 in Minnesota, 27 in Missouri, 25 in Tennessee, 22 each in North Carolina and Virginia, 18 in Georgia, 14 in Vermont, 12 in Kansas, 11 in Maine, 10 each in Alabama and New Jersey, 7 each in Kentucky, Massachusetts, Nebraska and Washington, 6 each in Connecticut and Mississippi, 5 in Texas, 4 in Colorado, 3 each in Arkansas, Florida, Maryland, New Hampshire, Oregon, South Carolina and South Dakota, 2 each in Idaho, Oklahoma and West Virginia, and 1 each in Louisiana and Montana.

There is some concentration of the industry, however, the first five states named doing fully 75 per cent of the entire business. Agricultural implements constitute one of the most important classes of export from the United States. The value of such machinery exported before the European war ranged from $30,000,000 to $40,000,000 annually. For the fiscal year ending 30 June 1915 the value exported dropped to about $10,000,000. See FARM MACHINERY.

AGRICULTURAL LAND BANKS. See FEDERAL FARM LOAN ACT; LAND CREDIT.

AGRICULTURAL LEGISLATION. United States. — The history of agricultural legislation in the United States dates back to 1862 when Congress granted to the several States 30,000 acres of land for each senator and representative in Congress with which to endow at least one agricultural college. In the same year the United States Department of Agriculture was established by law of 15 May. The first State to pay serious attention to agriculture as a scientific subject worthy of serious study on the part of the government was Connecticut which established the first agricultural experimental station at the Sheffield Scientific School in 1877; and it was not until 11 years later that the United States Department of Agriculture was created by law an executive department (21 May 1888) and the Secretary of Agriculture made a member of the Cabinet. In 1891 the Weather Bureau was transferred from the Department of War to that of Agriculture; and in 1905 the National Forest Reserves Department was handed over from the Department of the Interior to that of Agriculture, which, from this time on, continued to gain control of every part of the government activities related in any way to agriculture. Thus strengthened, it soon began to show its power for good. Chiefly through its instrumentality the Meat Inspection Law of 1906 was passed, and the National Pure Food Law, after a long and bitter struggle, finally became a fact. Control was also secured over

interstate transportation. The sum of $150,000 was secured from Congress, in 1907, to fight the Texas cattle fever in the South, and the moth pest in the Eastern States. The tendency of the Federal laws passed from this time on, in the interest of the development of agriculture, was to give more and more power and resources to the Department of Agriculture and to place in its hands the control of products intended for interstate shipment. The Appropriation Act of 1908 provided large sums for the continuance of the agricultural work already in hand and its rapid extension through more efficient administration. The care and extension of the national forests, the enforcement of pure food and drug inspection and the campaign against the extension of all kinds of cattle diseases were specifically aided by this act. The amplification of the activities of the National Weather Bureau and the more extended study of tuberculosis in cattle were also to receive much more serious attention than heretofore. In all these advances of the Federal legislature and the Department of Agriculture the various State governments followed, at first hesitatingly, then with interest, and finally with enthusiasm.

This national propaganda work dates from the reorganization of the Department of Agriculture in 1901 when it was put upon a more scientific basis and each of its various departments regulated and their functions defined by law, which added four new bureaus, namely, (1) Plant Industry; (2) Soils; (3) Chemistry; (4) Forestry. During the following year the effect of this reorganization was seen in the appropriation of $3,862,420 (in addition to the $720,000 previously granted for State aid) for the agricultural work in hand. By the close of 1909 laws had been passed in every State of the Union and in all the Territories including Hawaii, Guam, Alaska and Porto Rico, for the establishment of experimental agricultural stations maintained or supported in part by Federal funds. The Adams Act raised the level of the experimental work of American agricultural stations and induced the State legislatures to undertake more practical operations. A Federal law passed in 1910 regulated the manufacture, sale and interstate transportation of adulterated or misbranded insecticides and fungicides; and it was at once adopted by 15 States. In 1911 the sum of $2,000,000 was appropriated until July 1915 for the purchase of lands located at the headwaters of navigable streams, and their maintenance as national forests; and stringent measures were provided for the control of foods, feeding stuffs, fertilizers, seeds and other agricultural interests.

In 1912 agriculture received unusual consideration from Congress. Numerous bills, though not then passed, were introduced and, with others already presented, warmly discussed. Among those actually adopted were, (1) an act providing for plant quarantine, (2) making it necessary to secure a permit from the Secretary of Agriculture before importing nursery stock. The law also required a certificate of inspection from the proper authorities of the exporting country. Interstate movement of nursery stock was required to be reported to the Secretary of Agriculture. This requirement might also be exacted, when considered necessary, of imported fruits, vegetables and seeds. The Secretary of Agriculture was empowered to stop importations from, and to quarantine against shipments from, any State or section thereof in the interest of protection against any new pest. The administration of this work, which had already assumed large proportions, was entrusted to a Federal horticultural board composed of officials of the Federal Department of Agriculture, while the inspection was left in the hands of the State authorities. In 1913 agriculture continued to receive also very special attention from Congress, the chief interest centring in bills to improve the economic status of the farmer, to regulate markets, to provide increased facilities for agricultural credit and co-operative drainage, irrigation and general farm improvement. Steps were taken to better and increase the dissemination of agricultural information; and the police duties of the Federal Department of Agriculture were extended to include the protection of migratory and insectivorous game birds and the inspection of viruses and serums for the treatment of animal diseases.

The Smith-Lever Agricultural Extension Act, which had been before Congress for several years, was finally passed in 1914. It provides for extra-mural instruction and recognizes the agricultural colleges as the proper agencies in which such work should centre; and it is specially intended to aid in diffusing among the people of the United States information on agriculture, home economics and the practical application of both; and to give instruction and practical demonstration in these subjects to non-college students, through field demonstration, publications and otherwise. The act carries a permanent appropriation of $480,000 per annum ($10,000 for each State); and, in addition to this, $600,000 for the second fiscal year of operation, and thereafter an increase each year of $500,000 for seven years, reaching finally $4,580,000 as a permanent annual appropriation. The additional appropriations are to be allotted annually by the Secretary of Agriculture to the several States in proportion of the State rural population to that of the whole rural population of the country, conditional upon the provision by each State of an equal sum; thus making, when the act finally matures, $8,680,000 annually.

The United States Cotton Futures Act was also passed in 1914 to minimize speculative manipulation of the cotton market. This activity of the Federal government in promoting the welfare of agricultural interests was reflected in the activities of most of the States of the Union, for the provision of better rural credit facilities. Though no State agricultural bills became law in 1914, the good work done in the State legislatures was seen in the following year in the constant stream of State agricultural legislation and in the closer co-operation of farming interests throughout the country. In 1915 the interest in providing, by law, better rural credit facilities continued; and the Federal appropriation for the study of marketing problems was increased to $238,000 annually. Congress prescribed a standard barrel for fruit, vegetables and other dry commodities handled in

interstate commerce. This barrel must contain 7,056 cubic inches.

The Federal Farm Loan Act (q.v.), which had long been before Congress, in one form or another, finally became law in 1916. It created a Federal Farm Loan Board controlling a system of national and land banks empowered to make long-time loans on favorable terms on farm mortgages. See FARM LOAN ASSOCIATIONS.

State Legislation in the United States.— The years 1908 and 1909 were prolific in legislation for the control and improvement of agriculture. Florida, South Dakota, Tennessee, Mississippi, Texas, Utah, Vermont, Wyoming and several other States made legal provisions for the protection of various phases of agriculture, including the inspection of live stock, butter, cheese and other farm products, nursery stock brought into the country, sanitary conditions in rural districts, conservation of natural resources, protection against insect and other diseases in plant life, regulation of the sale of agricultural seed and the supervision of nurseries. Florida provided, by legislative act, for the teaching of elementary agriculture in the public schools of the State; Mississippi established a County Department of Agriculture to furnish information to agriculturists and develop the agricultural resources of the State; and provided agricultural high schools and inspection by the State entomologists. Louisiana provided for experimental agricultural stations in the great rice belt of the southwestern part of the State, for scientific investigation into rice growing. It also fixed a standard for cotton classification. Vermont created a State Board of Agriculture and Forestry; Texas, agricultural experiment stations and training in agriculture, in certain schools; Kansas, a Dairy Commission with power to enforce the sale of only pure butter, cheese, ice cream and dairy products in general; Porto Rico, a completely new program of agricultural education. Massachusetts authorized the establishment and maintenance of schools of instruction throughout the State, in gardening, fruit growing, floriculture, poultry keeping, animal husbandry and other branches of agriculture and horticulture, with the approval of the State Board of Education; and provision was also made for the protection and encouragement of forestry. South Carolina passed an act to encourage the joint action of "Consolidated Schools" doing practical class-room and field work in agriculture; and provided that when trustees of three or more approved schools raise $750 for agricultural instruction the districts shall be entitled to a like sum from the State, the total amount to be used to pay the salary of a qualified teacher of agriculture for the joint use of the several district boards, the county board of education and the State superintendent of schools, for three years. The year 1910 saw particular attention paid to the use of serums and other measures in various States of the Union owing to the ravages of hog cholera and the consequent heavy financial loss, more especially in Kentucky and Virginia. More stringent laws were also passed in these two and other States for the inspection and testing of cattle suspected of being diseased and for the destruction of those affected from contagious animal diseases. In Maryland stringent regulations were made for the sale of tuberculin, mallein and vaccine; and New York passed a new act for the care and keeping of cows. Virginia authorized the creation of commissioners for the drainage and reclamation of marsh lands, and established agricultural instruction in high schools. Ohio also made provision for having county commissioners drain and reclaim her marsh lands for agricultural purposes. Mississippi created county agricultural high schools, affirming the act already mentioned, which was held to be unconstitutional because it provided specifically for pupils of white blood only. Kentucky made a very radical move when it provided that farmers might legally agree to abstain from growing any kind of crop for any given period or season and to combine or pool crops of certain commodities and thus obtain for them a higher price. In 1911 new and vastly improved food laws were adopted in Florida, Idaho, Maine, Montana, Texas and Wyoming, leaving at that date only Arkansas, Mississippi and West Virginia without effective food laws. Many States regulated cold storage products; Maine provided for the inspection of canned goods; and Florida the inspection of fruit, a move which was followed by Idaho, Illinois, Missouri, Nevada, New Hampshire, New Jersey, Ohio and Utah. Pennsylvania authorized the construction of 300 State roads, and California provided $18,000,000 for the same purpose. Alabama, Colorado, Connecticut, Delaware, Illinois, Kansas, Missouri, Oklahoma, Washington, West Virginia and Wisconsin also enacted important good-roads legislation, more especially in the interests of the rural communities. Bills were passed in 16 States to aid in the reclamation of swamp lands; others to amend the then existing irrigation laws were enacted in most of the dry-land States or States having arid districts.

Many States provided means of fighting tree diseases and established bee insecticide and fungicide and ways of combatting insect pests. The distribution of hog cholera serum was regulated by law and stallion registration was provided for in many States. Ohio made agriculture obligatory in all the State non-city schools; Kansas prescribed a knowledge of agriculture for all State teachers; Idaho and North Carolina instituted systems of rural agricultural high schools; Massachusetts, Maine and North Dakota extended additional State aid to schools giving agricultural instruction. New York appointed a State advisory board to promote agricultural education and the advancement and improvement of country life. In 1912 Arizona and New Mexico provided new irrigation codes; New York passed a law to encourage the preservation of forests, and authorized counties, towns and villages to acquire and operate forests.

The year 1913 saw a decided movement on the part of many of the States to encourage market co-operation and to improve rural credit. Long-time loans were authorized in Vermont from municipalities to farmers for drainage projects. Michigan provided for the inspection and testing of sugar-beets at the factories, and numerous States regulated weights and measures and fruit containers, and provided for the employment of farm experts for advisory and demonstrative work throughout the counties. Irrigation and drainage received serious atten-

tion in many States. In New Hampshire, Washington and Montana new agricultural departments were established. Co-operative efforts distinguished the legislative acts of 1914. New York authorized a system of land banks, consisting of local savings and loan associations with a central State bank in New York city, with power to issue shares to locals. Colorado provided $1,000,000 school fund for long-time farm loans at 6 per cent. Virginia facilitated the formation of co-operative associations, while Massachusetts very greatly improved its credit law of 1909. Again drainage received serious encouragement from many State legislatures and milk laws were generally made more stringent.

Much recent agricultural legislation has taken place in the various States of the Union, but nearly all of it has been improvement, extension or definition of that already mentioned or described in this article.

LEGISLATION IN FOREIGN COUNTRIES.

Germany.— The German government early recognized the importance of agricultural education properly directed and encouraged by the state, and Germany was among the first nations of the world to establish agricultural colleges and experimental agricultural stations; and to carry on intense farming along scientific lines, her only serious competitors in this latter work being Belgium and Holland. Extensive investigations were made, in Germany, by legislative act, into crop rotation; and laws were passed providing for detailed study of diseases incidental to plant and animal life. The broad and scientific work done in this field inspired the governments of other countries to greater effort along these and other lines of agricultural endeavor. The works of the German scientists, in the form of translations, were scattered broadcast over the entire scientific world by the agricultural societies, bureaus and agencies of the various governments and thus helped vastly the work of furthering the interests of agriculture.

France.—After several years of very effective work, all the French government agencies engaged in the promotion of agricultural interests in the country were unified in 1911, in one Department of Agriculture, with bureaus of General Administration, Agricultural Instruction and Service, Waters and Forests, Breeding, Inspection, Agricultural Credit, and other co-operative agencies; and also a department for the protection of horticultural interests from insect pests and plant diseases. In 1912 the pure food laws were revised and extended to cover practically all the interests of the country. The system of national agricultural education was reorganized and made vastly more efficient; and commissions were ordered to study and combat plant and animal parasites and to classify useful and injurious birds. The following year the Ministry of Agriculture was reorganized along thoroughly modern lines; and its Advisory Superior Council of Agricultural Education authorized the expenditure of 12,000,000 francs for agricultural loans. Laws were also passed to encourage reforestation and the conservation of mountain lands.

Great Britain.— Closely following Germany and France, Great Britain saw the importance of legislative help to agriculture, and her influence had begun to be felt in the colonies and at home. The relation of the Board of Agriculture and Fisheries to that of Education had been clearly defined with reference to the promotion of agricultural interests; and, in 1909, provision was made for "aiding and developing agricultural and rural industries by promoting scientific research, instruction and experiments in the methods and practices of agriculture." In the same year the Development and Road Improvement Funds Act gave much prominence to the aiding and development of agricultural and rural industries by encouraging research, agricultural education and experiment, the organization of co-operative enterprises and the extension of the provision of small holdings. The improvement of rural transportation, the development of forestry through teaching and experimentation, the afforestation of lands, reclamation and drainage were all provided for; and horse breeding was subsidized. In the following years, among much active legislative attention to agriculture, special care was given to the registration and sale of fertilizers, feed stuffs and other agricultural commodities, and the inspection of seeds and nursery plants of all kinds. A Commissioner of Agriculture was appointed for Wales in 1912. Numerous restrictive and directive measures relative to agriculture were put into force, owing to the war, for the period of its duration.

Cuba. The budget estimate for 1910 provided $112,200 for the maintenance of six agricultural schools authorized for the several provinces by the Agricultural Act of 12 July 1909, since which time the island government has had a very active and efficient Department of Agriculture.

Brazil.—In 1909 Brazil organized, under the Federal government, a Bureau of Agricultural Inspection, which was empowered to make a special study of agricultural conditions, collect and disseminate useful information among farmers and to promote crop introduction and production. This bureau is also, by law, required to compile agricultural statistics (till then completely lacking in Brazil), to make crop estimates and to inspect agricultural schools and experiment stations. The sum of $300,000 was also authorized to be used in the northern Brazilian states for the introduction of irrigation and dry farming. A later law makes provision for opening up remote agricultural regions by rail and public highways; and it also provides for irrigation plants, reservoirs, artificial wells, river dikes and drainage in certain coast lands, in order to make them suitable for agriculture. Both the Federal and States' legislatures were active in the promotion of laws favorable to the betterment of agriculture throughout Brazil from 1909 to 1918.

Canada.— Ontario, Quebec and the Maritime Provinces early had each its department for looking after agriculture; and the Dominion government has long had a very active and efficient Department of Agriculture. Most of the eastern provinces, notably Ontario, have had agricultural schools in active and efficient operation for years; and much good work has been done in spreading abroad scientific methods in farming and in the organization of rural interests and the protection of the same. The central and western provinces have followed the lead of the eastern and they threaten

soon to surpass them in the extent and breadth of their legislative aids to agriculture. In 1909 Alberta provided for a Department of Agriculture in the Provincial University at Strathcona; and, in connection with it, demonstration farming "in those sections of the province not coming within the immediate scope of the work of the college itself." All the provinces followed in the steps of the Dominion government, providing special agricultural legislation. New Brunswick, by legislative act of 1913, established a system of agricultural schools; and British Columbia arranged to make long-time loans to agricultural associations.

In 1909 President Roosevelt invited Canada, Newfoundland and Mexico to a North American Conservation Conference at Washington. The invitation was accepted by the Dominion government and resulted in the creation by Parliament through the law of 19 May 1909 of a Commission of Conservation; and by an Order-in-Council (3 September) 32 members of the Commission were appointed, the ex officio members being the Ministers of the Interior, of Agriculture and of Mines, and the member of each provincial government of Canada charged with the administration of the natural resources of the provinces. At least one of the members of the Commission from each province must be a member of the faculty of a university in the province. The Commission has to collect, assimilate and digest exact information and to make it of practical benefit for the country, and to advise the government upon questions relative to the administration and conservation of natural resources with a view to their effective and economic use. The Commission set for itself two broad aims: "the taking of an inventory of Canada's natural resources, the molding of public opinion and the advising of administrative authorities with regard to the more intelligent management of the same." To this end the Commission formed itself into seven committees dealing respectively with Lands, Forests, Waters and Water Powers, Minerals, Fisheries, Game and Fur-bearing Animals, Public Health and Press and Co-operating Associations; and field investigations were ordered to be undertaken by these committees and a staff of technical experts respecting various natural resources. The committee on lands set itself to study and improve farming methods throughout the Dominion; and constructive measures were undertaken in 1912 to supplement the survey work done up to that date. In each agricultural district "illustration farms" were conducted at the government expense to demonstrate practically the benefits to be derived from scientific agriculture.

Latin America.—Practically all the countries of Latin America had, in 1918, departments of agriculture, commissions or other bodies dedicated especially to the promotion, each of the agricultural interests of its own national territory; and all had one or more agricultural schools with experimental agricultural stations established by legislative act and maintained by public funds, state or Federal, or both. Most of the Latin American countries extend both State and Federal aid and encouragement to agriculture and offer supervision and inspection covered by protective laws.

Mexico.—In 1909 the Mexican Federal Agricultural Commission, by direction of Congress, completely reorganized the agricultural interests of the republic and created a General Bureau of Agriculture with five departments; and provided for the establishment of national chambers of agriculture in various states, of which 11 were opened that same year. All public land was also withdrawn from sale in order to divert it to special agricultural uses contemplated by the Federal government. Since then the Carranza government has made provision for the subdivision of large estates in widely different parts of the country, into small holdings, with a view to encouraging the great body of Indians and mestizos composing the laboring and peon class of the republic, to become independent homestead holders and agriculturists. These small tracts of land are offered at exceptionally low prices and favorable conditions of payment. Provision has also been made for the further extension of agricultural teaching and more attention is being paid yearly to the broadening and making practical of the National Agricultural College, near Mexico City. An attempt has also been made to teach agriculture more extensively in the public schools. Uncultivated lands, of which there are still vast tracts in Mexico, have been taxed with a view to forcing their cultivation. Export duties have, in some cases, been put upon cattle to prevent their going out of the country in regions where, owing to the ravages of the revolution, there are not cattle enough. Legislative enactments have also been made to encourage the settlement of agricultural colonies in various parts of the republic.

JOHN H. CORNYN,
Staff of the Americana.

AGRICULTURAL MACHINERY. See FARM MACHINERY.

AGRICULTURAL PRODUCTION AND DISTRIBUTION IN THE UNITED STATES. The vast majority of American farmers are engaged in growing the great staple crops such as corn, wheat, cotton, oats, barley, potatoes, hay and tobacco, besides such products of animal industry as milk, beef, mutton and wool. The problem of distributing these products has not been left to the farmer. They are produced on a scale large enough to tempt dealers of various kinds and classes to enter the field and take them off the farmer's hands or organize a distributing system. Ordinarily the farmer's responsibility ceases as soon as these products leave the farm, though sometimes he does his own shipping, that is, he ships to one of the large markets or distributing centres and sells to a large dealer. In either case he sells to a well-organized market and throws his products into a distributing system whose grooves are worn smooth by the quantities which flow through them.

The high development of the long-distance freight service of the American railroads, and the comparative neglect of the local freight service, has tended toward a rather extreme territorial division of labor in the growing of the great staple crops. With long distance freight so efficient and so cheap as it is here, proximity to a market is no great advantage and is usually not sufficient to overcome even a slight physical

disadvantage in the production of these crops. There is, therefore, a tendency for each crop to be grown in marketable quantities in those sections where the soil, climate and other conditions are best suited to it, rather than in those sections which are nearest the centres of consumption. Therefore, we have what may be called belts of production such as the cotton belt, the corn belt, the wheat belt, etc. To attempt to grow wheat, for example, in Massachusetts would prove uneconomical. Although the wheat grower in this State would be very close to a vast consuming population, he would save comparatively little in freight rates in competition with the wheat grower of the far West. The latter, having such a marked advantage in the quality of his land, can easily pay the slight difference in freight rates and still drive his Eastern competitor out of the market. Even some of the more bulky and perishable products show the same tendency. Apples from the far West are regularly marketed in large quantities in the Eastern cities in competition with apples that are grown in the immediate neighborhood. Here again the advantages of a favorable climate and virgin soil seem to be sufficient to overcome the difference in freight rates.

Some of these producing belts or crop areas are fairly well defined and easily described; others are not. About 90 per cent of the orange crop of southern California is produced in a strip 10 miles wide and 60 miles long, lying at the foot of the Sierras. The cotton belt is a strip beginning in North Carolina and extending southwestward and westward to central Texas, lying in its eastern extremity midway between the mountains and the sea, widening as it approaches the Mississippi River and extending westward until it reaches the arid belt where lack of moisture prevents its further spread. Small areas devoted to Egyptian cotton grown under irrigation are found in the far West, particularly in the Salt River valley of Arizona. The wheat belt is divided into two parts, the northern and the southern. In the northern belt where spring wheat predominates, though winter wheat is gaining ground, we find its greatest concentration in the valley of the Red River of the North. The southern belt, where winter wheat predominates, is noticeable in southern Indiana and Illinois, north central Missouri, but finds its greatest concentration in west central Kansas and Nebraska, along the border between what is conventionally called the humid and the arid belts. Another large producing area not included in either of these belts is found in eastern Washington. The corn belt is more difficult to describe for the reason that corn is grown in practically every county in the United States. That which is known as the corn belt, however, is the territory in which corn is the leading money crop and where it is grown on the largest percentage of the total acreage under cultivation. The belt thus defined is first noticeable in western Ohio. It extends through north central Indiana and Illinois, covering the whole State of Iowa and northern Missouri, widening as it approaches the Missouri River and extending beyond that river to the borders of what is known as the humid belt,—that is, approximately to the hundredth meridian of longitude. It reaches its greatest density, however, in north central Illinois, particularly in a remarkable strip of prairie extending from the Wabash to the Illinois River. Its next greatest area of concentration is along the Missouri River from about the latitude of Sioux City, Iowa, on the north to St. Joseph, Mo., on the south. It is not customary to speak of an oats belt, probably for the reason that oats is nowhere grown as the principal crop, but it is largely grown in the corn belt in rotation with corn. Thus it happens that the area of largest oats production is identical with that of the largest corn production, with the same centres of concentration. There is nothing that could be called a potato belt, though there are several detached areas of large production, notably the eastern half of Aroostook County, Me., western New York, central Wisconsin and a small area in Minnesota just north of the twin cities. The greatest centre of apple production in the country is western New York. The Ozark region of northwestern Arkansas and southwestern Missouri is another area of concentration, as are also several valleys in southern Washington, northern Oregon and western Colorado.

The corn crop of the country exceeds in value any other crop, and in most years any two other crops. It so much exceeds the demand for it for purposes of direct consumption that the greater part of it has had to be sold in more concentrated form. Various corn products have recently been manufactured, large quantities of it have been used for the purpose of manufacturing alcoholic drinks; but by far the largest part of it has been used for the production of meat. It therefore happens that the areas of pork production are almost identical with the corn belt. The fact that the corn belt lay contiguous to the great ranges of the arid West built up a great cattle-feeding industry, especially in the Missouri River valley. It would not be quite accurate to say that the corn belt is therefore the centre of beef production because much beef is produced outside the corn belt; but the centre of high-class beef production or the centre of the business of fattening beef is in the corn belt.

A small but rapidly increasing minority of American farmers are engaged in growing agricultural specialties for which there is no well-organized market or distributing system. These products are too numerous to be catalogued, but they include most perishable fruits and vegetables and fancy products of various kinds, including fancy horses and breeding stocks. These products cannot be thrown on to the market as can the large staple products for the reason that there is no well-organized distributing system ready to handle them. Therefore the grower of such products must give a great deal of attention to their marketing and distribution. In some respects this is a more difficult if not a more important problem than that of growing them. The following figures show the totals in millions of bushels of the different crops harvested in 1916: Winter wheat, 685; spring wheat, 206; maize, 2,673; oats, 1,141; barley, 195; rye, 43; buckwheat, 17; potatoes, 406; hemp, 16; apples, 253; peaches, 54; hay, 70,000,000 tons; and tobacco, 1,035,000,000 pounds.

A glance at the railroad map of the United States shows that the main lines run east and west instead of north and south. This is only an indication of a much larger economic fact,

namely that the territorial division of labor is between East and West rather than between North and South. There is a natural and permanent division of labor between different climatic zones. This gives rise to transportation lines running north and south. The division of labor and exchange of products between East and West are due in part to difference of soil and other physical conditions, but mainly to the fact that the East is older and the West younger. The older communities develop the highly technical industries first, leaving to the younger communities the task of producing raw materials and the cruder products. In short, the division of labor and exchange of products between East and West are mainly between the manufacturing and commercial regions on the one hand and the agricultural, mining and lumbering regions on the other.

This fact, in so far as it affects agriculture, derives considerable significance from its bearing upon the problem of distributing farm products. It means that the bulk of our agricultural produce is grown at vast distances from the centres of consumption. Another fact which points in the same direction is that our railroads have given great attention to long distance freight and almost none to local freight. These may be said to be the dominating facts in the organization of our agricultural markets. The amount of produce which is grown within hauling distance of the consumer is so small as to be negligible. Accordingly very little account is taken of it and very few provisions have been made for handling it. Dealers of all kinds have planned their business primarily with a view to handling produce from a distance shipped in by rail, and only secondarily, if at all, with a view to handling produce which is hauled to town by farmers nearby. Nor have many cities made provision for an open market where local producers might sell directly to consumers.

From the standpoint of the city consumer this situation has certain advantages as well as disadvantages. It relieves him of dependence upon local producers, giving him a choice among large numbers of producers scattered over wide areas. Again, it lengthens the season over which a perishable fruit or vegetable may be consumed. But it tends to discourage the local producer who might otherwise supply a very superior, because fresher, product in its proper season. Lacking adequate machinery for handling and distributing his product, he is often at a positive disadvantage in competition with a more distant producer who sends his product through a well-organized system with well-worn channels.

The predominance of this system of long-distance marketing has necessitated certain changes both in method and machinery. When the farmer could haul his produce to town and show it to the consumer, marketing was simple and its methods could be crude without great loss of efficiency. The method was that which is known as selling on inspection. It becomes, however, a very expensive and laborious process when producer and consumer are widely separated. It requires a chain of middlemen, each of whom must make a profit. Selling by sample is an improvement upon selling on inspection because it is less expensive and laborious; but it is possible only where there is confidence in the seller, that is, confidence that the whole quantity offered for sale will be like the sample submitted for inspection. This is a case where confidence makes economy possible. A still more economical method, but a method which requires still more confidence, is that which is known as selling on grade. If the product is properly graded the name of the grade takes the place of a sample so that it is not even necessary to submit a sample for inspection. This requires confidence not only in the honesty of the seller but also in the scientific accuracy of the one who does the grading.

The nearer to his farm the process of grading can take place the better it will be for the farmer. Except in the case of the very large farmer who sells on a scale large enough to make an impression on the market, selling on grade is an impossibility for the farmer. The small farmer operating alone cannot establish confidential relations with large numbers of dealers nor can he gain such a reputation on the market as to secure the general acceptance of his grades. A large group of farmers, however, acting co-operatively, may achieve this result. Every great co-operative selling organization among farmers which has achieved notable success owes its success to its system of grading as much as to any other single factor. Not every farm product can be graded accurately enough to permit of its being sold by grade. Selling by sample or on inspection is then the only method. In these cases it is sometimes possible to sell rapidly, economically and on a large scale by the auction method. Horses, for example, are not easily graded. So far as the writer knows they are never sold on grade. Selling by sample is obviously impossible. The auction method seems to have demonstrated its superiority over other methods in every large horse market where horses have to be sold at wholesale and in large numbers. The same method is being tried in a large number of other cases including such diverse products as cheese, apples, fish, oranges, besides all sorts of vegetables.

The commission merchant is a peculiar and more or less temporary development growing out of the necessity of selling products on a distant but badly organized market. To him the producer consigns his product to be sold for whatever it will bring, the commission merchant deducting a fixed commission on the price received and returning the balance to the producer. Under this method the producer assumes all the risk and the commission merchant none. Besides, this method invites abuses because the producer has very few and very inadequate checks upon the commission merchant. This presents temptations which human nature is not always strong enough to withstand. In a disorganized and uncertain market the distant producer frequently has no other recourse than to consign to a commission merchant. As soon, however, as the market becomes organized and the demand fairly calculable the commission merchant gives place to the jobber who buys from the producer and sells again, thus assuming the risk and relieving the producer of it. During the transition stage, however, many houses practice both methods, becoming jobbers when the market is firm and prices advancing and commission merchants when the market is unstable or

prices falling, thus playing the time-honored game of "heads I win, tails you lose."

The parcels-post and express companies are beginning to serve as agencies through which the producer may sell directly to distant consumers. The success of this method is obviously limited to those products which can be accurately graded and put up in standardized packages, in short, to those articles which can be sold on grade rather than by sample or on inspection. There is no reason, however, why there should not be a great increase in the use of these agencies in this restricted field. Moreover, this is an expanding field. The tendency is more and more toward grading and standardizing all products which are capable of being graded and standardized. Before much can be done in this direction it will be necessary for the government, either State or Federal, to define grades more fully and accurately. To define a grade is merely to establish a standard of quality. This is coming to be quite as important as to establish standards of quantity as is already done when the government defines weights and measures.

There is another large fact which must be remembered in any discussion of the problem of getting agricultural products from producer to consumer — that is, three-fourths of all the telephones in the world are in the United States and Canada. This means that American housewives, more than any others, have formed the habit of ordering goods by telephone. It is not likely that this habit will decline. It is more likely to grow. If it does, it means that direct selling by the farmer to the consumer is possible only within a very limited field. The store which can always be reached by telephone and which can make a prompt delivery will have an advantage in getting the trade of the telephone-using housewife.

This paper may be summarized as follows: (1) From the standpoint of distribution two classes of products are grown in the United States, first, the great staple crops for which there is a well-organized market and which sell at a quotable price; second, agricultural specialties for which there is no well-organized market and which do not sell at a quotable price. The latter class presents the difficult problem in distribution. (2) There are two distinct problems in the marketing and distribution of farm products, especially the minor crops and agricultural specialties. The first is that of distributing the products where they are grown within a wagon-haul of the consumer. The second is where the products are grown at such a distance from the consumer that the producer cannot accompany them to market. Of these, the latter is much the larger problem in the United States. (3) There are three distinct methods of selling products: First, selling on inspection; second, selling by sample; and third, selling on grade. Of these three methods the last is the most efficient where the product can be satisfactorily graded; but the conditions are more exacting, requiring confidence not only in the honesty of the seller but also in his skill and accuracy as a grader. (4) There are four characteristic agencies through which the producer who is distant from the market may sell his products. The first and crudest is the commission merchant, the second is the auction house, the third is the jobber and the fourth is the parcel-post and the express service. Of these the last is the most direct but it requires confidence as between buyer and seller, besides an efficient and accurate system of grades and standards.

THOMAS N. CARVER,
Professor of Political Economy, Harvard University.

AGRICULTURAL SYNDICATES, differing from agricultural associations in that they take on more the character of co-operative societies and act as commission merchants for their members in the sale of their produce. It is estimated that they now number 5,000 in Europe with a membership of 800,000 individuals. Their most complete development has been reached in France among the vineyardists. Their funds are usually derived from a commission charged their members on the business transacted for them, whether in selling their produce or buying fertilizers, farming machinery or seeds. They are also sometimes active in politics in promoting the farming interests. In some countries their influence has been potent enough to obtain subsidies from the government.

AGRICULTURAL TRACTORS. See TRACTORS.

AGRICULTURE IN THE UNITED STATES. Land and Labor. — The two factors which, more than any others, have given character to American agriculture are: First, an abundance of land and, second, a scarcity of labor. These two factors almost necessarily belong together because land is abundant whenever and wherever there is not enough labor to cultivate it thoroughly, and labor is scarce whenever and wherever there is more land than can be thoroughly cultivated. The necessary and logical result of this combination of abundant land and scarce labor is extensive as opposed to intensive farming. Extensive farming consists in using a small quantity of labor on a large quantity of land, whereas intensive farming consists in using a large quantity of labor on a small quantity of land. As extensive farming is the logical system in a country where land is abundant and labor scarce, so intensive farming is the logical system in an over-populated country where labor is abundant and land scarce.

Not only was the character of our agriculture largely determined by this combination of scarce labor and abundant land, but many of our political and social institutions, and much of our political and social history as well. It gave rise, for example, to the institution of slavery which was primarily an agricultural institution, together with all that grew out of that institution. Scarce labor and abundant land mean necessarily dear labor and cheap land. This is a situation extremely favorable to those farmers who expect to work with their own hands. Cheap and abundant land means free opportunity for self-employment on the part of the agricultural laborer, whereas scarce and dear land means limited opportunity for self-employment, most of those who work the land being compelled to work for others. Scarce and dear labor means necessarily a

liberal income for the self-employed laborer. On the other hand, this is a situation which is very unfavorable to the proprietary farmer who does not expect to work with his own hands but has to depend upon the labor of others to cultivate his lands. The cheapness of land reduces his income from that source and the scarcity and dearness of labor makes it difficult for him to secure the necessary help.

In Virginia and the other southern colonies this difficulty was increased by the exceedingly liberal land policy. In Virginia, for example, there were three methods by which an individual might acquire title to land:* One was to buy a share of the stock of the London Company, to which the land had been granted by the British Crown. These shares were called "Bills of Adventure" and the holder of each share, besides participating in the profits of the company, was entitled to receive without further cost 100 acres of land. The second method was by meritorious service. Ministers of religion, physicians and other public servants, including those who had performed valuable manual labor, were sometimes granted tracts of land as rewards of merit. The third method, which was really the one generally used, was known as "head right." Under this right anyone who transported to the colony any person, including himself, at his own expense, could secure, without further expense, 50 acres of land for every person so transported. Later on this method became so laxly administered that any free person could secure land under it without much regard to the original requirements.

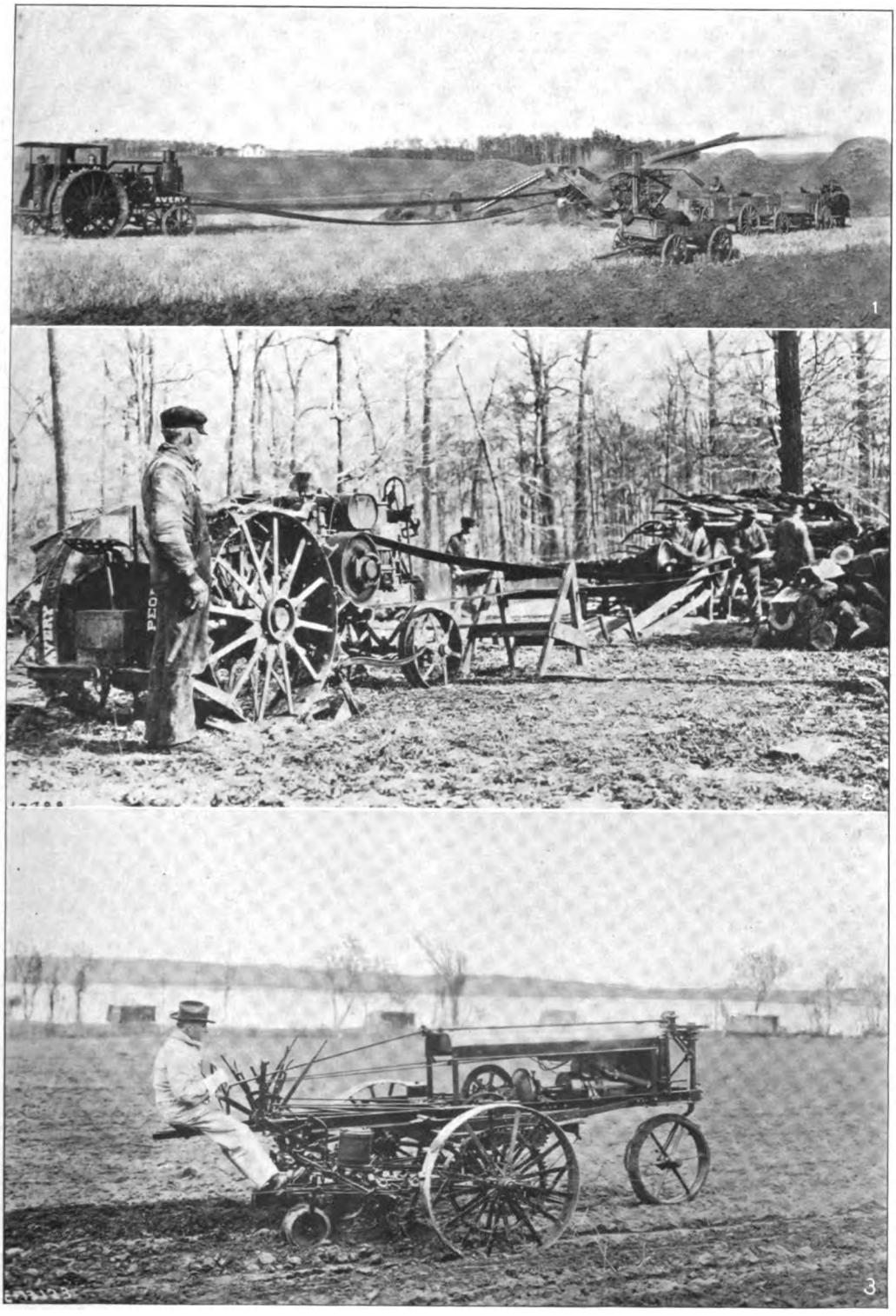
This liberal policy made it extremely difficult for any large landowner to keep sufficient help to cultivate his land. No man was willing to work for wages when he could, practically without money and without price, secure a tract of land and become a landowner himself. The difficulty was first met by the system of indentured servants. An indentured servant was simply a person who was too poor to pay for his own transportation to the colony. In order to get there he would agree to work for a term of years for someone who would advance the money. After his term of service had expired he became a free man and could become a landowner on the same easy terms as anyone else. This gave the large landowner an opportunity to keep a laborer for a short term of years but his labor supply had to be constantly renewed. Under these conditions African slavery seemed to furnish a solution of the problem which confronted the large landowner. It was the ruin of the small white farmer who worked his own land and who thereafter had to sell the products of his own labor in competition with that of slave labor. If they had been awake to the situation they would at once have prevented the establishment of slavery or, later, have abolished it, since they vastly outnumbered the large landowners who alone found slavery profitable.

The conditions in New England were more favorable to a continuation of free labor for several reasons. In the first place the soil and climate were less favorable to the production of great staple crops such as tobacco and cotton. Consequently there was less farming for profit and more farming for a living. In the second place there were fewer large landholders who needed an abundant supply of cheap labor. In the third place the land policy was a little less liberal. That is to say, there were more restrictions and obstacles in the way of land ownership. Land was less frequently granted directly to individuals but generally to companies or groups of individuals, who founded towns. The individual settlers generally received their grants from these companies or towns. Some of the earlier towns were settled as church communities. The formation of a town amounted practically to the organization of a church congregation and then settling as a congregation upon a tract of land and calling it a town. Weeden, in his 'Social and Economic History of New England,' says that "It was the admirable economic land tenure which shaped the early towns; without this, even their religious and political systems might not have established their distinctive system of living." The restrictions upon land ownership made it a little less easy for the landless man to become a landowner and the harshness of the climate, the sterility of the soil and the difficulty of reducing it to cultivation made landownership a little less desirable in New England than it was in the South. Consequently it was, on the one hand, easier to keep a supply of labor for those who needed it, and, on the other, there was less demand on the part of landowners for a large supply of cheap labor in New England. Therefore, slavery never appealed to the New Englanders as an economic necessity as it had to the wealthy landowners of Virginia. Nevertheless there were, in limited numbers, both indentured servants and negro slaves in New England. But neither class ever figured prominently as factors of agricultural production, being kept rather as domestic servants by wealthy townsmen.

Labor-saving Devices.—Another characteristic of American agriculture which grew out of the original factors of scarce labor and abundant land was the large use of labor-saving devices and, until recently, the general absence of land-saving devices. This was a logical and natural result. Labor being scarce and hard to get it was necessary to economize it. Agricultural machinery in America was consequently designed almost exclusively with a view to enabling a given amount of labor to cultivate a larger area of land rather than to enable a larger population to subsist on a given area. Neither the reaper, the mower, the twine-binder, the thresher, the corn planter, the grain drill, the cultivator, the corn-husker nor any other characteristic American farm machine is calculated to increase materially the product per acre. They are designed to increase the product per man by enabling each man to cultivate more acres. In the use of labor-saving devices American farmers have shown themselves to be the most scientific and progressive farmers in the world. In the use of land-saving devices they have not kept up with some of the older and more thickly populated countries, as shown by the fact that our product per acre is noticeably lower than theirs. However, our product per man is

*Consult Bruce, H. A., 'The Economic History of Virginia'; also Carver, T. N., 'Principles of Rural Economics', (p. 67).

AGRICULTURAL MACHINERY



Photograph from Underwood & Underwood, N. Y.

1 Avery 40–80 H. P. Tractor and 36 x 60 Yellow-Fellow Grain Separator threshing
2 Avery 8–16 H. P. Tractor sawing wood
3 Side view of new Avery Motor Corn Planter

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1 National Farm Tractor Demonstration at Fremont, Neb. This tractor is pulling the discs and harrowing the ground at the same operation

2 The Gile Tractor and Plow at work

noticeably higher which, from the economic standpoint, is of the utmost importance. It is generally true the world over that intensive cultivation and a large product per acre are found in conjunction with the poverty of the agricultural workers. This is a necessary result of a small product per man.

During the period of slavery labor-saving devices were not much used in the South, mainly for the reason that slave labor was so cheap that it was not necessary to economize it. In another sense, slaves took the place of machinery.

However, further expansions of our agricultural area must come slowly in the future as compared with the rapid expansion of the past. Then it was merely a matter of moving westward and settling upon land that was easily tillable. Hereafter it must depend upon the progress of discovery — the discovery of methods of using lands hitherto considered unfit for cultivation. Vast areas of dry land west of the one hundred and second meridian and considerable areas of the South, especially in the coastal plain, may yet be reduced to profitable cultivation, besides smaller areas here and there which may yet be irrigated. Up to the present time the progress of discovery in these fields has not been rapid. A great many experiments and failures must be recorded before many successes can be achieved. If the expansion of our tillable area continues to be retarded and if, at the same time, the number of our farmers should increase, a change must come in our methods if we would maintain a large product per man. Instead of merely increasing our acreage in proportion as the number of farmers increases, we must hereafter increase the product per acre, otherwise the product per man must decline.

Native Crops.— Another outstanding fact regarding American agriculture is the extent to which it is a continuation of that of the aborigines. Our most important crop is maize, Indian corn or, as it is universally called in this country, corn. It exceeds in value that of any other two field crops combined. The first European settlers found it growing here under cultivation by the Indians and they learned from the Indians how to grow it. The potato is another product native to the American continent. Next to wheat and rice, these are the two most important of the world's food products. Tobacco was, until it was superseded by cotton about 1803, the principal money crop of the South and it was, like corn and the potato, a product of native agriculture.

The earliest colonists, both in the North and the South, found that the hog flourished in the woods, feeding on the mast and the roots. Accordingly, the raising of hogs was one of the first branches of animal husbandry to be developed. Corn proved to be admirably adapted to the fattening of hogs. With the development of the great prairie States of the Mississippi valley, which now form what is known as the corn belt, hog-raising increased rapidly and pork-packing became one of the leading industries of the cities of that region. From about 1830 to 1863 Cincinnati was the greatest centre of pork-packing. In the latter year it was surpassed by Chicago, which has held first place ever since.

The raising of cattle has always been, since the earliest settlements, a frontier industry. Before the soil was broken by the plow the natural grasses furnished cheap and abundant pasturage. Accordingly, the cattle ranges, since the first settlement of Jamestown, extended just west of the line of permanent settlement. They moved through the Southern States in advance of tobacco and cotton until they reached Texas. There the rangers from the United States came into competition with those from Mexico, producing complications which afterward led to the Mexican war.

Immediately after the Civil War the wide ranges of Texas having become overstocked, there begun a vast migration of cattle from the southern to the northern ranges. The route, known as the "Old Cattle Trail," was merely a strip of land of indefinite width fringing the western settlements. After the building of the transcontinental railways the points at which the trail crossed these railroads became great shipping points from which cattle were sent to the great markets and packing towns of the corn belt.

Wheat, like beef, has been primarily a frontier crop. Both these products are most economically produced by extensive rather than intensive methods; that is, by the use of little labor on much land. Accordingly, under what is known as the territorial division of labor, those sections where labor is relatively abundant and land relatively scarce are given over to the crops which can be cultivated economically by intensive methods, while those which require extensive methods, migrate to those sections where land is relatively more abundant and labor relatively scarcer. The wheat belt, in accordance with this law, has gradually migrated westward, first through western New York and Pennsylvania, later through Ohio. Indiana and Illinois. Here it split, the spring wheat belt moving northwestward through Wisconsin, Minnesota and the Dakotas, while the winter wheat belt moved southwestward through Iowa, Missouri, Nebraska and finally into Kansas.

A clearer idea of our present agricultural situation can be gained through a brief survey of our agricultural history. This history is divisible into five main periods. The first is the same as our colonial period and may be called the period of trial and adaptation. The second is that comprised between the dates 1789 and 1830 and may be called the period of the conquest of the forest. The third is the period from 1830 to 1860 and may be called the period of the conquest of the prairies. The fourth is the period from 1860 to 1888 and may be called the period of the settlement of the Far West. The fifth is the period from 1888 to the present time and may be called the period of reorganization.

The Period of Trial and Adaptation.— The colonial period was necessarily a period of experiment and adjustment; of trial and adaptation. The settlers faced conditions of which they had had no previous experience and they had to acquire their own experience through bitter trials and disappointments. The summers were hotter and the winters far colder than anything with which they were familiar. The plant and animal life also differed from that of the Old World. What crops to grow and how to grow them was consequently an

unsolved problem for the first settlers except in so far as the practices of the Indians gave them a clue.

Jamestown, for example, is in the same latitude as the northern coast of Africa. The first English explorers had visited the coast of Virginia in summer when the heat was more intense than in England. A natural inference was that the new country would be adapted to a semi-tropical agriculture. The fig and the olive were tried and there were numerous experiments in silk culture. These were soon given up in favor of stock-raising and the growing of corn and tobacco. In New England, besides cattle and hogs, most of the English grains and garden fruits and vegetables were tried out. In the middle colonies wheat was grown successfully and exported to the West Indies. So successful were the colonists in this work of trial and rejection that the main features of our present agriculture were all fixed. Until our present Federal Department of Agriculture began sending its plant explorers to the ends of the earth in search of new crops, not a single new crop was introduced into this country since the colonial period except sorghum and alfalfa.

The Period of Conquest of the Forest.—Before the War of Independence some of the Colonial population had spilled over the Alleghanies into the great interior basin. The movement westward on a large scale began soon afterward. The various colonies ceded to the Federal government their claims to the western lands. The government then began a land policy which encouraged settlement. This policy began as a financial policy and ended, through a series of transitions, as a social policy. That is to say, the government began selling the public land as a means of filling the treasury and of paying off the Revolutionary War debt. It ended by giving the land in small farms, without money and without price, to landless men who would actually live upon and cultivate it.

The first general ordinance for the sale of the national domain was passed in 1785. Among other things it provided for the rectangular system of surveying, which has been followed ever since. Until 1800 the land was sold only in large tracts, 640 acres being the smallest unit. During the next 20 years (1801–20) the smallest unit was 160 acres and the lowest price was $2 per acre. From 1821 to 1840 the lowest price was $1.25 per acre and 40 acres was the smallest unit. In 1841 was passed the first general pre-emption act. This withdrew public lands from sale to the general public, reserving them for sale to actual settlers. These were allowed to purchased limited areas, upon which they had actually settled, at the uniform price of $1.25 per acre. The final stage of the transition was reached in the Homestead Acts of 1862 and 1864. Under these acts the actual settler who lived on his land and cultivated it for a period of years was given a tract not exceeding 160 acres without money and without price. There have been several supplementary acts, such as the Timber Culture Act, the Desert Land Act, all designed to make it easy for the landless man to become a proprietor.

The beginnings of this public land policy form by far the most important phase of our national history during the period we are now studying. With it began the real history of the Great West. Getting the people on to the land, bringing the land under subjection, laying the foundations of a future civilization, are the most fundamental and far-reaching enterprises of any government.

In 1793 the saw gin for separating the seed from the cotton was invented. This followed a remarkable series of inventions for the manufacture of cotton cloth which had created a great demand for cotton. The cotton gin enabled the Southern States to supply that demand and greatly stimulated the growing of cotton. Cotton therefore soon rose to first place among the products of the South, superseding tobacco as the main crop. An unfortunate result was to give a new lease of life to slavery, which was beginning to be unpopular even in the South.

The beginnings of an improved live stock industry were made during this period. The famous sire of American trotting horses, "Messenger," was imported from England in 1788. The great "Justin Morgan," the sire of the Morgan breed, was foaled about the same time, probably in 1789. George Washington began the breeding of mules of a superior quality, having received two fine jacks as presents from Lafayette and the King of Spain. Several importations of cattle for breeding purposes, particularly of the Shorthorn and Hereford breeds, were made about this time. Merino sheep in considerable numbers were imported from Spain. There had been restrictions upon their exportation from their native country, but during the disturbances growing out of the Napoleonic wars, particularly the Peninsular war, these restrictions were ineffective. Many bands of sheep were broken up and sold and American buyers were not slow to take advantage of these opportunities. There were said to be 5,000 Merinos in the United States by 1809. The growing of hogs in the Ohio valley became a leading industry. In 1805 fat cattle began to be driven across the Alleghanies to the Eastern markets.

The movement for the organization of agricultural societies began during this period. Societies for agricultural improvement were organized in South Carolina in 1784, in Pennsylvania in 1785, in New York in 1791, in Masssachusetts in 1792. An exhibition of agricultural products was held in Georgetown, D. C., in 1810 and another in Pittsfield, Mass., in the same year. In 1816 a somewhat larger one was held in Brighton, Mass. These were the forerunners of the State and county agricultural fairs which have since played a very important part in our agricultural development.

Period of the Conquest of the Prairies.—The third period, which we have called the period of the conquest of the prairies, might well have been called the period of transformation. The period between 1830 and 1860 witnessed, on American soil, a transformation of farming methods such as no previous period of 30 years had even witnessed. It was the period of the introduction of farm machinery driven by horse power. At the beginning of this period practically every farm operation except plowing, harrowing and the drawing of carts was performed with human muscles. By the end of this period, corn was planted and

cultivated, wheat and other small grains were drilled, harvested and threshed, hay was mown and lifted into the mow or on to the stack by horse power — that is, on the more progressive farms.

The first factor in this transformation, aside from the native ingenuity of the American farmer, was the opening up of the great prairies of the West. At the beginning of this period the vanguard of the great army of settlers was just emerging from the great forest which extended continuously from the Atlantic coast to the western end of Lake Erie and the Wabash River in the middle streak, and to the Mississippi and beyond on the north and on the south. These prairies, though regarded as of doubtful value by the first settlers, soon proved themselves to be more fertile than the timber lands previously settled. Besides they were smooth and comparatively level and free from stones and other obstructions. They were therefore well adapted to the use of horse-drawn machinery. This fact, together with their seemingly boundless expanse, offered a challenge to the inventor which he was not slow to accept. The reaper, the mower, the thresher, the corn planter and the cultivator followed one another in quick succession.

Another important factor in bringing about this transformation was the coming of the railroad. In 1830 there were no railroads in the United States. In 1860 there were 30,000 miles in operation and they had penetrated every State east of the Missouri River. They brought the markets of the world near to the Western fields and furnished an outlet to all that could be produced by means of the new farm machines. Through the repeal of the English corn laws, English markets were opened to American farm products in 1849. New England factory towns were growing at the same time, so that the factory populations of both Old and New England began to be fed with food grown in our great West.

The joint result of all these changes was an agricultural revolution, not only in this country, but in Europe as well. A flood of agricultural products began to pour into the Eastern markets and later into the European markets. The Eastern farmers and the European farmers began to feel the pressure of the new competition. On the more broken and stony farms of New England the farmers were unable to stand the pressure and public attention began to be called to the abandoned farms. This pressure, which began during the period we are now studying, continued and increased during the next period.

The Period of the Settlement of the Far West.— The period from 1860 to 1888 begins with the use of horse-drawn machinery well established. Many improvements were made, particularly in reaping and threshing machinery, during this period. The Marsh harvester, the wire binder and the twine binder followed in quick succession. The roller process of manufacturing flour made it possible to manufacture excellent flour out of Northern spring wheat, a thing which had previously been considered impossible. This, together with the improved harvesting and threshing machinery, made it possible to cultivate the vast prairies of the Northwest, making Minneapolis the centre of the flour manufacturing industry. The building of the transcontinental railway lines, most of them projected in advance of settlement through subsidies of government land, still further hastened the settlement of the far West. More important, possibly, than any of these were the homestead laws of 1862 and 1864, already referred to, which gave the land free of charge to actual settlers. The tide of settlement literally swept across the prairies during the seventies, the eighties and the early nineties, all but exterminating the buffalo and crowding the Indians into reservations where they could be protected against the competition of the white man. The settlers were mainly people from the Eastern and middle Western States, but their numbers were greatly increased by the immigrants from northern Europe who began coming to the United States in unprecedented numbers after the close of the Civil War. During the decade from 1860 to 1870 there arrived more than 2,000,000 immigrants, nearly 3,000,000 during the decade from 1870 to 1880, and 5,250,000 from 1880 to 1890. During the decade from 1870 to 1880 more than 297,000 square miles were added to the cultivated area of the United States. This is a territory equal to that of Great Britain and France combined.*

One result of this rapid expansion of our agricultural area was the disorganization of agriculture in the older States and in Europe. Wheat began to be exported in enormous quantities, and its price, in consequence, fell to unremunerative levels. While this, and a similar fall in the price of other products, tended to discourage the farmers of the older sections, it did not deter the western settler from the work of extending the agricultural frontier farther and farther west. Many of the settlers, in fact, had no intention of remaining in the farming business, planning rather to get a piece of government land, hold it for a few years and then sell it at a price which would remunerate them for the time spent. Crops were grown and sold, meanwhile, in order to live until a buyer with a satisfactory price arrived. They lived literally by mining the soil and selling it, rather than by farming. Against this kind of competition the recent buyers of farms found it hard to strive. The result was a vast amount of agricultural discontent. Shameless demagogues flourished and fattened on this discontent, telling the farmers that it was the fault of the monetary system, or that it was due to some other more or less occult force rather than to the over-supply of agricultural products. The seventies, the eighties and the early nineties witnessed several political movements among the farmers of the South and the West, none of which, however, succeeded in seriously modifying the financial system.

The complete reorganization of the cotton-growing industry constitutes the most violent agricultural change of this period. In 1860 the bulk of the cotton crop was grown by slave labor. After the Civil War cotton prices were soaring because of the cotton famine during the war. It sold for 43 cents a pound in 1865 and for 30 cents in 1866. Under the stimulus of these prices many planters undertook to grow cotton on a large scale with hired negro help and with borrowed capital. The price fell rapidly and brought bankruptcy to many of the

*Bogart, 'Economic History of the United States,' p. 267.

planters. But both the landowners and the negroes had to live, and to live mainly on cotton. It was therefore necessary that some workable system should be devised. This was found in the one still in vogue throughout the greater part of the cotton belt, at least in the eastern half of it. The land is worked by negro tenant-farmers who cultivate small tracts on shares. Thus both landowner and laborer share in the risk and the danger of complete bankruptcy is avoided.

The Period of Reorganization.—The year 1888 is chosen as the beginning of the fifth period in our agricultural history, not because any profound change was noticeable on that date, but because there began about that time a series of changes which are destined to produce,—which have, in fact, already begun to produce,—profound agricultural changes. Congress had, in the preceding year, passed the famous Hatch Act, or the Experiment Station Act, as it is sometimes called. Agricultural experimentation began at once on an enlarged scale. This led to a more comprehensive and systematic application of the principles of experimental science to agriculture than had ever been undertaken before.

Another large fact is that through the rapid occupation of the public lands the available free lands in the humid belt were nearing exhaustion. The old pioneering period in American agriculture was therefore drawing to a close and a new period was opening, wherein the farms must first be created by considerable outlay of labor and capital before profitable farming can begin. During the old period waste land was merely land which lay to the west. It was only necessary for the settlers to move to it in order to bring it within the cultivated area. From now on waste land is land which goes to waste not because of geometrical distance, but because of bad physical, chemical or political conditions. Bad physical conditions may be described as (1) too wet; (2) too dry; (3) too stony; (4) too sandy. The cure for the first is drainage; for the second, irrigation; for the third, the clearing of the stones; for the fourth, the supplying of humus through the plowing under of manure and green crops. Bad chemical conditions may be described as (1) too much acid, and (2) too much alkali. The cure for the first is lime. The second is a complicated problem too difficult for discussion within the limits of this article.* Bad political conditions may be described as (1) bad taxation; (2) undesirable social surroundings; (3) poor educational facilities; (4) poor sanitation. The cures are obvious.

The point to remember is that it is no longer possible for the landless man who can acquire a team, a wagon, plow, harrow and a few other implements, to begin farming on free public land. The drainage of wet land, the irrigation of dry land, the clearing of stony land, the supplying of humus to sandy land are laborious and expensive processes. These opportunities are consequently open only to men with some capital, either of their own or advanced to them on easy terms by others. The same may be said of land which is either too sour or too alkaline. Land which is going to waste through bad political or social conditions is more abundant than is commonly supposed. A detailed description here would provoke resentment and do no good.

In the early settlement of the continent, when serious difficulties had to be overcome, experience showed that the colony system rather than the system of individual settlement was the practicable method. The system of individual settlement flourished under the easy conditions found in the Mississippi valley. Now that we are again face to face with difficult conditions, the lesson of history shows that we must again return to the colony method. In the field of irrigation the Mormons and the Greely colony of Colorado have furnished us with excellent examples.*

The tendency, which has almost become a habit, of well-to-do farmers to leave the farms and retire to the towns, is primarily a result of bad social conditions in the open country. These call peculiarly for the colony idea as a corrective. Though the physical difficulties in the way of the new pioneering call for united or community effort, such as can only be found where the colony idea prevails, these do not point so unerringly toward the colony system as do the social difficulties. Where families of unlike ideals, customs and traditions are thrown together, higgledy-piggledy, in the same neighborhood through the method of individual settlement, it is difficult to secure effective community action. Such a settlement may succeed in overcoming the physical difficulties where they are as easy as they were in the middle-western prairies, but it can never succeed where they are as great as they are in most of the lands which remain to be subjugated, and it is utterly incapable of handling the social difficulties which are found in very many of our rural communities.

Unity of sentiment and feeling, or like-mindedness, which is the condition of all effective community work, may grow out of a feeling of common and pressing necessity, as in the case of the early pioneers in time of physical danger; it may be based upon a common kinship, nationality or language, as in the case of some Scandinavian communities of our Northwest, or it may be based upon a common religion, as in the case of the early New England towns, many Pennsylvania German communities, a few Quaker communities, a few Scotch Presbyterian neighborhoods, and especially the Mormon settlements of the Far West. A combination of all these unifying factors gives the best results. The agricultural statesmen of the future must build our agricultural civilization on community action. Effective community action must have some unifying sentiment to give it body and consistency. Therefore the problem of agricultural statesmanship is to discover or create these unifying sentiments.

In almost every agricultural region there is one crop which, under the conditions of soil, climate and markets, is more profitable than any other, such as cotton in the South, corn in the Middle West and wheat in the Northwest and in the Middle Southwest. In the early development of every such region there is a tendency toward what is called the "one crop

*Consult Hilgard on 'Soils.'

*Consult Katharine Coman, 'The Economic Beginnings of the Far West.'

system," under which all the labor of the farmer is concentrated on his most profitable crop. Later on there is, in every progressive community, a tendency toward diversification. The reason for the change is not that one crop has ceased to be more profitable than any other. There are two reasons which combine to force the change. The first is the necessity of economizing the soil, and the other is that of economizing the labor time of the farmer. Growing one crop continuously on the same soil tends not only to exhaust those elements in plant food which are required by the crop in question, but to multiply the enemies and parasites which prey upon or injure it. A change of crops not only gives the soil a rest, but interferes more or less with the development of the enemies of each crop. The crops which are introduced into the rotation need to be chosen very carefully in order to give the soil the maximum rest and also in order to afford the most effective check upon the enemies of the major crop.

Quite as important, however, is the necessity of economizing the labor time of the farmer and his labor force. No crop requires equal time and attention at all seasons of the year. When the major crop requires all the time of the labor force it would be uneconomical to turn aside to work on a less profitable crop. But if the farmer grows as much of the major crop as he can handle when it demands the most attention, he will have time to spare at other seasons of the year. This time will ordinarily be wasted unless he has other crops which require his time then. If minor crops can be found which do not demand attention when the major crop is requiring it, but can be handled at other times and seasons, the farmer can obviously make a more economical use of his labor force by growing some of these minor crops.

Neither of these reasons in favor of rotation are very strong in a new and undeveloped farming community. In the first place the soil is usually so rich as not to require immediate conservation. In fact, the pioneer farmer was usually in great need of other forms of capital, while possessing a superabundance of soil fertility. From his point of view it was not unbusinesslike to reduce his over-supply of one form if by so doing he could increase those forms which he lacked. Therefore he would be inclined to grow only his most profitable money crop. In the second place, on a pioneer farm there are so many other things to do besides growing crops that the farmer need never spend an idle day from the beginning to the end of the year. Fencing, draining, erecting buildings, clearing stones, stumps and other obstructions and a multitude of other improvements have to be made. Under such circumstances it is natural and economical that he should grow only his most important money crop, and spend his time during the slack seasons making these necessary improvements.

In case, however, as in some portions of the South, the labor force is not inclined toward steady and continuous work the year round, the tendency to stick to the principal money crop rather than to rotate and diversify persists long after the pioneering period has been passed. Seasons of strenuous work followed by periods of idleness seem to be preferred by the negro farmer. This is one of the chief obstacles to the proper diversification of crops in the South. There is probably no other crop which the cotton farmer could grow which is so profitable as cotton. Therefore, if diversification meant less cotton, it would probably reduce his income. But if he will equip himself with first-rate teams and tools he can grow more cotton than he can possibly pick. There is a tendency, therefore, to work with inferior teams and tools — with one mule per man, for example, instead of with two, three or four, because one man can usually grow as much cotton with one mule as he can pick. The way for the cotton farmer to increase his income is to cultivate more land, growing as much cotton as he can pick, and some other crops besides, provided he can find crops which can be handled when cotton does not demand the full time of his labor force. In order to do this each hand should work at least two mules, though four would be better if the land is fairly smooth and free from obstructions. This habit of working with large teams and tools has had a great deal to do with the prosperity of the farmers of the upper Mississippi valley. It is also one of the factors in the increasing tendency toward rotation and diversification.

The principal crop areas of the country must be defined in terms of the principal money crops rather than in terms of the subsidiary crops. The cotton belt, the corn belt and the spring and fall wheat belts are fairly well defined, provided we observe the above definition. There is, for example, scarcely an agricultural county in the United States in which corn is not grown, but it is grown as the principal money crop in what is known as the corn belt. Wheat is widely grown, but only in restricted areas as the principal crop. Potatoes are grown as the principal money crop in small areas scattered here and there, such as Aroostook County, Maine, parts of western New York, of Michigan, Wisconsin, Minnesota, Montana and Colorado; barley in parts of Wisconsin and California; buckwheat in a few counties in Pennsylvania and New York; hops in a few counties in New York and Washington; tobacco in many and widely scattered areas from Louisiana to Vermont, particularly in the Connecticut valley, southern Ohio, eastern Pennsylvania, southern Wisconsin and the border States between the cotton belt and the corn belt.

Turning from field crops to farm animals, we find the hog in greatest numbers in the corn belt, cattle are widely scattered, dairy cattle being found in greatest numbers in the thickly populated States of the east, and beef cattle in the corn States and the contiguous grazing States to the west. Horses are raised in greatest numbers in the corn States, though Kentucky, Tennessee and Texas raise considerable numbers. Sheep are diminishing in numbers, but are grown in considerable numbers in Ohio, Michigan, Wyoming and the Pacific Coast States.

If one were to describe American agriculture in terms of the size of the business unit, one would say that the characteristic farm is middle-sized farm, or the one-family farm. That is, it is a farm of such size as can be worked by the labor force of one family, with an occasional hired man, when equipped with

the best teams and tools that are to be had. It differs from the small peasant farm of Europe —*La petite culture*— in that it includes a larger area, and because of the larger area makes use of larger teams and tools. The tendency toward this type of farming is growing, as shown by the fact that the large farms —those of above 1,000 acres— are diminishing in number and area, and that the small farms also —those under 100 acres— are diminishing in number. In other words, the tendency is toward the farm of from 160 to 320 acres. From the standpoint of production, this middle-sized, or one-family farm is the most efficient unit yet discovered in this country. From the trading point of view it is less efficient than the larger unit. In other words, where the farmer's success depends primarily upon his efficiency in production, the middle-sized farm will beat all others in competition. But where the farmer's success depends primarily upon his efficiency in bargaining, that is, in buying and selling, the large farm has the advantage. In the growing of staple products, for which there is always a well-organized market where they always sell at a quotable price, the farmer's success will depend more upon his skill as a producer than upon his skill as a bargainer. But in the growing of specialties, which do not sell at a quotable price and for which there is no organized market, the farmer's success will depend more upon his success in selling than upon his success in producing. This is the field where the large farm has the advantage. In the other field, which is much the larger, the middle-sized farmer more than holds his own in competition with the big farmer.

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AGRICULTURE, Department of, an executive department of the United States, whose head is a member of the Cabinet with the title secretary of agriculture. It was formed early in 1889 under President Cleveland, the first secretary being Norman J. Colman of Missouri; he was succeeded in the same year, under President Harrison, by Jeremiah M. Rusk, of Wisconsin; in 1893 President Cleveland in his second term appointed J. Sterling Morton, of Nebraska; in 1897 President McKinley appointed James Wilson, of Iowa, who was succeeded in 1913 by David F. Houston, of Missouri, the present incumbent (1916). Its germ was a distribution of seeds to farmers by the Commissioner of Patents in 1836, enlarged by Congress in 1839 to include the prosecution of agricultural investigations and collection of agricultural statistics; in 1854 a special appropriation was made and an entomologist employed; in 1855 a chemist and botanist were added and

a propagating garden begun. In 1862 the Agricultural Bureau was established separate from the Patent Office, and President Lincoln appointed Isaac Newton, of Pennsylvania, Commissioner of Agriculture; the last commissioner was Mr. Colman, the first secretary. The Department's quarters in Washington are in a large park near the Washington Monument. Its functions are expressed by statute as: "To acquire and diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word, and to procure, propagate and distribute among the people new and valuable seeds and plants"; but scientific and administrative duties have been heaped upon it till it has become not only an enormous workshop and museum of every class of scientific research relating to plant and animal life and that of agricultural animals, but an establishment of practical services in trade and commerce, quarantine, statistics, tree-planting, road-making, irrigation, insecticides and almost everything that can affect the interests of those engaged in raising and marketing all articles that grow from the ground or living things that feed on them. Even the Weather Bureau was transferred to it, in 1891, from the War Department.

Its cost is over $20,000,000 a year, of which about $2,200,000 goes to extension work. The detailed statement below will give a full conspectus of its activities.

ORGANIZATION AND FUNCTIONS.

Office of the Secretary.—Supervision of public business relating to the agricultural industry and management of department subdivisions; advisory supervision over government agricultural experiment stations; control of quarantine stations for imported cattle and of interstate cattle quarantine, including inspection of cattle ships; also carrying into effect the interstate game laws and those on importation of noxious animals, with authority to control that of other animals.

The Weather Bureau.— Records daily existing atmospheric conditions and formulates therefrom — for distribution — forecasts of probable weather during the succeeding 48 hours. It maintains a central office in Washington, and 197 subordinate stations in the United States and West Indies, whose work is supplemented by the services of 4,500 voluntary observers. It also receives daily telegraphic reports of observations in Canada, Mexico, the Azores and the western coast of Europe.

The Bureau of Animal Industry.— Investigates the nature and prevention of communicable diseases dangerous to live stock, and takes measures for their extirpation; inspects live stock and their food products in interstate and foreign commerce, also the transport vessels for exported and quarantine stations for imported animals; disseminates information on our dairy interests and their foreign markets; and reports on our animal industries and means of improving them.

The Bureau of Chemistry.— Studies the chemical problems of agriculture; soils, fertilizers and irrigation waters; agricultural products and industries; insecticides and fungicides; foods of man and beast; raw materials, products and processes of agricultural-chemical industries; chemical relations which modify the results of environment — as soil, latitude, altitude and meteorological conditions — on agricultural products; inspects food products imported or for export; and examines quality of materials used in road construction. The chemical problems of other departments are turned over to it. It has under its charge the inspection of foods and drugs, as authorized by the Pure Food Act.

The Bureau of Plant Industry.— Studies plant life in relation to agriculture, including vegetable, pathological and physiological, botanical, pomological, grass and forage plant investigations and experiments; has charge of experimental gardens and grounds, the Arlington experimental farm, Congressional seed distribution, seed and plant introduction and tea-culture experiments.

Forest Service.— Prepares and executes plans for conservative lumbering of woodlands, public or private; investigates trees and methods for planting, and gives practical assistance to tree-planters; studies commercially valuable trees for their special uses in forestry, and the relations between forests and fire, grazing, lumbering, stream flow and irrigation; maintains a photographic laboratory and collection and a library. On 1 July 1915 it had under its administration 162,773,280 acres of national forest land.

The Bureau of Soils.— Studies physical and chemical properties of soils, and materials and methods of artificial fertilization, with their influence on the original soils; classifies and maps soils in agricultural districts to show the distribution of soil types for adaptability to certain crops and their management; investigates alkali problems and their relations to irrigation and seepage waters; reclamation of abandoned lands; studies tobacco soils and methods of cultivation and curing, introduction of improved varieties and methods of exporting tobacco. The total area covered by detailed soil surveys in the United States from 1899, when the work was begun, to 30 June 1915 amounts to 369,928 square miles.

The Bureau of Crop Estimates.— Collects and digests statistics of agricultural production; area annually sown to each of the leading crops, their condition on the first day of each month, the quantitative results at close of the crop year, and estimated farm value 1 December. Supplementarily it collects periodical information on minor crops of importance, meadows and pastures, and the principal foreign crops. The stock of corn, wheat and oats on United States farms at certain regular fixed dates is estimated, with the proportion shipped out of the county where grown; the number and value, by species, of animals on United States farms at the beginning of each year, and the annual losses from disease and exposure; also the annual clip of wool and average weight of fleeces, by States and Territories. It computes the world's production of the chief crops, by countries, and prices of principal agricultural products in various United States markets.

The Division of Publications.— This is the publishing house of the Department. It has general charge and assignment of expenditures under the appropriation for printing and distributing agricultural documents, preparation

and distribution of the 'Year-Book,' 'Farmers' Bulletins,' and other bulletins, reports and circulars; supervises the Department's printing and binding in the government printing office; prepares the drawings for illustrations, and prepares and distributes official information and advance notices to agricultural writers. During 1915 the Division issued 913 new bulletins, pamphlets, circulars, reports and documents of all kinds, the printed copies aggregating 26,496,661.

The Bureau of Entomology.— Studies the entire field of insect life in its relation to humanity; primarily, insects injurious directly to man, to agriculture and horticulture, and to stored products; the geographic distribution of such insects, and their relations to climate. It conducts field and laboratory experiments with different classes of remedies, and reports thereon. It also studies beneficial insects — both those which are the source of industries, like the honey-bee, the silkworm and the fig-fertilizing insect and those indirectly beneficial by preying on injurious ones. It makes large collections of insects and of insecticidal machinery and chemicals.

The Bureau of Biological Survey.— Studies the geographic distribution of animals and plants, and maps the natural life zones of the country; also investigates the economic relations of birds and mammals, recommends measures for the preservation of beneficial and the destruction of injurious species, and carries into effect the Federal laws concerning the importation of wild birds and other wild animals, and the interstate game laws.

The Office of Public Road and Rural Engineering — Investigates the United States system of road management and the best methods of road-making and maintenance; experiments on best methods of road-building and analyzes chemical and physical qualities of road materials; co-operates with agricultural colleges, experiment stations and local authorities in building short sections of road as object lessons, and conducts investigations into proper methods of irrigation and drainage.

The Division of Accounts and Disbursements.— Audits and pays all accounts and adjusts claims against the Department; decides questions involving the expenditure of public funds; prepares advertisements, schedules and contracts for annual supplies, leases, agreements, letters of authority and all letters to the Treasury Department and Department of Justice; issues requisitions for the purchase of supplies and requests for transportation; prepares the annual estimates of appropriations, etc.

The Library.—The librarian purchases books and periodicals, supervises their arrangement and cataloguing, and has charge of the preparation of catalogues, indexes, bibliographies, etc.

Federal Horticultural Board.—Established to administrate the Plant Quarantine Act of 20 Aug. 1912, regulating the entry of foreign nursery stock and other plant products into the United States and providing for domestic and foreign quarantines on account of plant diseases and insect pests.

Office of Markets and Rural Organization.— Enforces an act of 18 Aug. 1914 which taxes the privilege of dealing on exchanges, boards of trade and similar places in contracts of sale of cotton for future delivery, whose object is to curb speculation. The office also makes a study of co-operative organizations among farmers with the object of extending such organization more widely and it requires and spreads information regarding improved methods in the marketing and distribution of farm products.

States Relations Service.— A department which was formally established by Secretary Houston on 1 July 1915, in accordance with the provisions of the Smith-Lever Agricultural Extension Act of 8 May 1914, providing for a wide extension of the co-operative activities carried on with the various State colleges on a permanent basis. The Smith-Lever act appropriates money as follows: The sum of $10,000 of Federal funds is granted to each of the 48 States. In addition to the $480,000, the act appropriates for 1915–16 $600,000 additional, which will be increased annually by $500,000 until 1923, when the annual government appropriation will be $4,580,000. The additional appropriation is divided among the States in the same proportion that the rural population of each State bears in relation to the rural population of the country as a whole. Each State, on its part, must grant a sum of money toward the funds equal in amount to the Federal grant. The money from the States will bring the joint extension work funds up to $1,680,000 in 1916. In addition to all these provisions, however, the Department of Agriculture will, during 1916, spend from its own appropriations $1,025,000 for farmers' co-operative demonstration work and other field instruction in special subjects.

The new States Relations Service will include within its jurisdiction the former Office of Experiment Stations, which superintends the work of the experiment stations and sends its agents all over the world in search of useful plant life that may be introduced into the United States. Since the Service was established all the States have assented to the provisions of the Smith–Lever act. A single agricultural college in each State has been designated as the beneficiary of this act. In several where the college is not coeducational a co-operative arrangement for work in home economics has been made with the State college for women. All the State agricultural colleges receiving the benefits of the States Relations Service have entered into co-operative relations with the Department of Agriculture, and in 46 States these institutions and the Department are conducting all their extension work in agriculture and home economics under the terms of a general "memorandum of understanding, which is used as a basis for a great variety of co-operative project agreements.

One of the chief works which is being undertaken is the establishment of the "county agent" system. The county agent is an agricultural expert who acts as the joint representative of the local community, the State through its agricultural college and the Federal Government through the Department of Agriculture. The functions of the county agent are various; he advises the individual farmers in their work, instructing them in all modern and scientific methods of planting or stock raising, assists them in the buying of their supplies on

a co-operative basis and advises them in the marketing of their products. His business is, in fact, to do all in his power to further the interests of his local community as an agricultural centre. Already 1,200 counties have established such county agent headquarters. Another line of extension work which will be greatly stimulated by the States Relations Service is the organization of agricultural clubs among school children, in connection with the work of the elementary schools. The same is true of the demonstrations in domestic economics, which will now be extended to the colleges which number girls among their students.

The following figures will give an idea of the relative attention that is being paid to the various fields of this work. Of a total of $4,782,270 the following sums will be spent on: Administration, $391,652; publications, $107,980; county agents, $2,497,426; home demonstration, $542,732; movable schools, $218,000; school children's clubs, $236,917. It will be seen that the largest item, over one-half of the total, is county agent work. The rest of the appropriation will be spent in minor sums on pig, poultry and live-stock associations.

JOHN H. CORNYN,
Editorial Staff of The Americana.

AGRIGENTUM, ăg-rĭ-jĕn'tŭm, a town in Sicily, of which this was the Roman name, the Greek name having been Agragas and the modern Italian name being Girgenti. It is thought to have been founded by Dorian colonists about 582 B.C. Its situation on the southern shore of the island was peculiarly strong and imposing, standing as it did on a bare and precipitous rock about 1,000 feet above the level of the sea. During the Greek period Agragas rose to a position of great wealth and importance and was adorned with splendid temples and public buildings. Among Sicilian towns it was second only to Syracuse. In 406 B.C. the city received a blow from which its dignity and power never recovered, in its capture by the Carthaginians. Under the Roman dominion we do not hear much of the town, which, however, seems to have been always prosperous, having mines as well as the most fertile territory. The town is celebrated in Greek history as the birthplace of the famous philosopher Empedocles, and the celebrated and almost legendary tyrant Phalaris was ruler there — in what capacity is not clearly recorded. In the history of fine arts Agragas was famous as the centre of a school of sculpture and refined architecture. We still have vestiges of this in the extraordinary group of temples, that dedicated to Hera Lacinia; that called "Temple of Concord," a remarkably well-preserved monument of the Doric style; that called "Temple of Hercules," much ruined; and, finally, the gigantic Temple of Zeus, a building wholly unique in Grecian art as having columns engaged in the walls of the cellar and a great interior evidently treated as a public hall.

AGRIMONY (*Agrimonia*), a genus of plants belonging to the family *Rosaceæ*, distinguished from the other genera of the same tribe (*Roseæ*) by having but two carpels enclosed in the deep tube of the calyx, from 7 to 20 stamens and small notched petals. *A. eupatoria*, or common agrimony, is an erect, hairy, herbaceous plant, native of Europe. Several species are widely distributed in eastern North America.

AGRIPPA VON NETTESHEIM, Heinrich Cornelius, a versatile German diplomat, historian, philosopher and author: b. Cologne, 14 Sept. 1486; d. Grenoble, 18 Feb. 1535. He led a remarkably diversified life in France, Italy, Switzerland and the Netherlands, and wrote among other works: 'De Occulta Philosophia' (1510) which describes and defends magic; 'De Nobilitate et Præcellentia Feminei Sexus,' dedicated to Margaret of Burgundy (1532); and 'De Incertitudine et Vanitate Scientarium et Artium, atque Excellentia Verbi Dei Declamatio' (1527), a satire on sciences and on the pretensions of scientists. Consult Morley, H., 'Life of H. C. Agrippa,' (London 1856); Prost, A., 'Corneille Agrippe, sa vie et ses oeuvres' (Paris 1881).

AGRIPPA I and II. See HEROD AGRIPPA I; HEROD AGRIPPA II.

AGROPYRON, a genus of grasses including about 50 species, mostly perennials. The best known are *A. repens,* couch grass or twitch grass; *A. caninum,* bearded wheat-grass; *A. divergens,* wire bunch grass; *A. pseudo-repens,* western couch grass. and *A. tenerum,* slender wheat grass. *A, repens* is in some districts considered a pest to agriculture. It is extremely hard to eradicate. It is considered a good hay grass in western United States. The species are common in America, Europe and Australia. *A. repens* is considered a good binder grass for railroad embankments and places liable to washouts and its roots are used in medicine, having aperient properties.

AGTELEK, ŏg'tĕ-lĕk, or **AGGTELEK,** Hungary, a village in the county of Gömör, 40 miles southwest of Kaschau, on the road from Budapest to Dobsina. Pop. 500. It is a famous tourist resort on account of the neighboring Baradla ("steaming place") stalactite cavern, which with its remarkable chamber, passages and subterranean stream extends underground for over five miles.

AGUADILLA, ä'gwa-dē'lya, Porto Rico, capital of a municipality on the western coast, near the northern extremity, 20 miles by rail from Mayaguez. The town, founded in 1775, is well built on a spacious bay forming an excellent trading outlet for the sugar, tobacco, coffee, cocoanuts, etc., of a fertile agricultural district. Pop. of municipality 21,500; of town 6,200.

AGUADO, ą-gwā'dō, Alejandro Maria, Marquis de las Marismas del Guadalquivir, Spanish financier and millionaire: b. Seville, 29 June 1784; d. Gijon, 14 April 1842. Of Jewish parentage, he early became a soldier, fighting in the war for Spanish independence. Exiled, he went to Paris in 1815 and in colonial trade and banking with Cuba and Mexico acquired great wealth. From 1823 to 1831 he negotiated four loans which saved Spain from bankruptcy. For these services he was ennobled by Ferdinand VII. He acquired large estates in France and became a naturalized citizen in 1828. He left a fortune of over $12,000,000 (60,000,000 francs), and a collection of splendid pictures which were acquired by the French government.

AGUAS CALIENTES, ä'gwąs kä'lē-ĕn'tās, Mexico, capital of the state of the name, on the line of the Mexican Central Railroad, 860

miles south of El Paso, Tex., 364 miles north of the City of Mexico and 415 miles northwest of Tampico, on the Gulf of Mexico. Elevation 6,106 feet above the sea. It is especially noted for its hot springs (the name Aguas Calientes signifies hot waters), which have been highly prized ever since their discovery. Here are located the principal shops and one of the division headquarters of the Mexican Central Railroad, the result of which has been the establishment of a considerable colony of Americans. Here, also, is located one of the greatest silver-copper smelting plants in the world, employing a great number of men and adding materially to the business prosperity of the community. In the city and its immediate vicinity are several woolen factories, a flouring mill, a starch factory and other important manufacturing enterprises. Perhaps the most notable special industry, and for which the place has become really famous in domestic circles, is the making of drawnwork table cloths, napkins, doilies, handkerchiefs dress trimmings and accessories of every description, in which a considerable part of the female population is employed. Imposing church edifices and beautiful parks or plazas greet the eye on every side. The cause of education,—both primary and advanced,—has long received great attention in Aguas Calientes. The educational institutions are most creditable, not only in numbers and capacity but in the thoroughness and progressiveness of the professors and teachers by whom they are conducted. The local financial institution—the Bank of Aguas Clientes,—has a capital of $600,000. The National Bank and the Bank of London and Mexico maintain branches here, and there is an agency of the Bank of Zacatecas. The library of the Institute of Sciences contain over 4,000 volumes. As a place of residence the city has long been a prime favorite.

AGUE. See MALARIA.

AGUESSEAU, ą'gĕ-sō, Henri François d', chancellor of France: b. 1668; d. 1751. According to Voltaire, he was one of the most learned of Frenchmen and his long and honorable career is distinguished chiefly by his defense of the Gallican Church and the rights of the people, in opposition to the imposition of the «Unigenitus» papal bull, favored by Louis XIV and his councilors. He also ranks high as a reformer of French jurisprudence. A complete edition of his works, edited by Pardessus, J. M., was published in 16 volumes (Paris 1818–20). Consult Butler, C., 'Memoir of the Life of H. F. d'Aguesseau' (London 1830).

AGUILAR y CORREA, ä'gē-lär, Antonio, Marqués de la Vega de Armijo, Spanish statesman: b. Madrid, Spain, 30 June 1824; d. 1909. He studied law in the universities of Seville and Madrid, then became prominent in the politics of the Union Liberal party. His first office was that of governor of Madrid and during his term of office he distinguished himself by his severity against vice. He next became minister of public works, then minister of the interior. On the downfall of his political party, 22 June 1866, he assisted in the preparations for the revolution, which was successful. In 1873 he was sent as the representative of Spain to France. After the restoration he recognized Alfonso XII. In 1883 he passed over to the opposition and the following year was elected «Concejal» for Madrid. On the death of the King, Alfonso XII, his party returned to power and he was elected deputy for Madrid and Lucena. In 1889 he became minister of state, but a year later his party fell from power. Late in 1892, under the presidency of Sagasta, he was again made minister of state which position he resigned a few months later in order to be elected president of the congress, a position he held until March 1895, when Sagasta fell from power. In 1898 he was elected president of the congress of deputies. Aguilar was a member of the Royal Academy of Moral Sciences and Politics and the Royal Academy of History; and was for a time director of both.

AGUILAR, Grace, Anglo-Hebrew author: b. London, 2 June 1816; d. Frankfort-on-Main, 16 Sept. 1847. 'The Spirit of Judaism' (1842); 'The Jewish Faith' (1846) and 'Home Influence' (1846), of which over 30 editions were issued, are her chief works. 'The Vale of Cedars, (1850); 'A Mother's Recompense' (1850) and 'The Days of Bruce' (1852), edited by her mother, appeared after her death.

AGUILAR DE LA FRONTERA, ą'gē-lär dah lą frŏn-tä'rą Spain, city of Cordova province, Andalusia, on the river Cabra, 26 miles by rail southeast of Cordova. A former fortified town on the Moorish frontier, it has an interesting history. Its modern importance is derived from its olives and white Montilla wine and the thriving agricultural and manufacturing trade carried on. Pop. 13,000.

AGUILAS, ä'gē-ląs, Spain, seaport town of Murcia province on the Mediterranean, the terminus of the Huercal-Overa Railway, 38 miles southwest of Cartagena. It is the commercial outlet for the iron, minerals and agricultural produce of the region, and imports large quantities of coal. Pop. 16,000.

AGUILERA, Ventura Ruiz, ä-gē-lä'rä, ventoo'rä roo'ĕth, lyric poet, «the Spanish Beranger»: b. Salamanca, 2 Nov. 1829; d. Madrid, 1 July 1881. After a medical course at home he became a Madrid journalist (1843) and an important official under Liberal governments; later a director of the Madrid Archæological Museum. His bold incisive editorials endeavored to instil fervid national patriotism into the masses, an aim also of his poems like 'National Echoes' and 'Satires.' His 'Elegies' (1862) were masterpieces translated into nearly all European languages. He wrote also 'The Book of the Fatherland' (1869); 'A Christmas Legend' (1872); 'The Modern Arcadia'; collections of novelettes, etc.

AGUILLON, dä'gi-lyŏn', François d', Belgian Jesuit, philosopher and mathematician: b. 1566; d. 1617. He became rector of the Jesuit College at Antwerp and was the author of an important work on optics, containing the earliest description of stereographic principles, published in 6 volumes (Antwerp 1613).

AGUINALDO, ä'gē-näl-do, Emilio, leader of the insurgents in the Philippine insurrection of 1896, and their chief in the Spanish-American war of 1898: b. Imus 1870 of Chinese and Tagalog parentage. His father was a planter and he received his early education at the

College of St. Jean de Lateran and the University of St. Tomas in Manila. Later he became the protégé of a Jesuit priest, and was for a time a student in the medical department of the Pontifical University of Manila. In 1888 he had some conflict with the authorities and went to Hongkong, there becoming interested in military affairs and acquiring a knowledge of warfare. He quickly learned something of the English, French and Chinese languages, together with various native tongues, achieved a reputation for intelligence, ability, shrewdness and diplomacy and had a personal magnetism which gave him great influence among his countrymen. On the outbreak of the rebellion against Spanish authority in 1896 Aguinaldo became a commanding figure with the insurgents. He was at the head of the diplomatic party, which succeeded in making terms with the Spanish government, the latter paying a large sum to induce the Philippine leaders to lay down their arms. Aguinaldo quarreled with his associates in Hongkong over the division of this money and went to Singapore, where he came in contact with the United States consul shortly before the breaking out of the war between the United States and Spain. On the representations of the consul Commodore Dewey telegraphed to have Aguinaldo sent to him and the insurgent leader arrived at Cavité shortly after the battle of Manila Bay. Aguinaldo was given opportunity to organize the Filipinos against the Spanish authority; but no promises were made to him and the insurgents were never officially recognized by the Americans. Friction early arose and the Americans protested against the cruel treatment of Spanish prisoners by the Filipinos. The strain became serious at the capture of Manila, the insurgents claiming the right to sack the city, which the Americans denied. On 12 June 1898 Aguinaldo organized a so-called Filipino republic, with himself as president, but very soon proclaimed himself dictator. He protested against the Spanish-American treaty of peace, which ceded the Philippine Islands to the United States, and claimed the independence of the islands. Organizing an extensive conspiracy among the native population of Manila, he ordered the complete massacre of the Americans, together with the entire European population of the city, while yet at peace with them. The plot was discovered in time and failed. The intention of Aguinaldo to oppose by force the American occupation had been growing increasingly evident and on the evening of 4 Feb. 1899 his forces attacked the American lines in the suburbs of Manila. The news of this overt action caused the prompt ratification of the Spanish-American treaty by the United States Senate. Aguinaldo made a determined resistance to the Americans and the rainy season soon prevented the latter from following up their uniform successes in the open field; but early in 1900 organized insurrection, which was chiefly confined to the Tagalog nationality, was broken up, Aguinaldo driven into hiding and his correspondence, order books, etc., captured by General Funston, who captured Aguinaldo himself at Palawan, Luzon, 23 March 1901. On 2 April he took the oath of allegiance. Consult Wildman, 'Aguinaldo' (Boston 1901); 'Aguinaldo et les Philippins' (Paris 1900).

AGULHAS, ä-gool'yäs, **Cape,** the most southern point of Africa, lies about 100 miles east southeast of the Cape of Good Hope, in lat. 34° 49′ S.; long. 20° 0′ 40″ E. The point is very dangerous for ships; fogs are frequent, the currents are uncertain and there are many rocks to seaward.

AGUR, a-goor′, the name of an unknown Hebrew sage mentioned only in Proverbs xxx, 1. There he is called the son of Jakeh. Much discussion has arisen concerning the name. Jerome and many Jewish rabbis of his time held the name to be a pseudonym used symbolically. Agur is not mentioned as the author but as the collector of the book of Proverbs. It is thought by some that he was one of Hezekiah's men. Another theory is that he was the son of the Queen of Massa, whose kingdom was located near the head of the eastern branch of the Red Sea.

AGUTI. See Agouti.

AHAB, King of Israel 875–853 (?) B.C., son and successor of Omri (1 Kings xvi-xxii). He found his kingdom in extreme peril; whole districts in the north had been swallowed up by the growing Syrian kingdom with capital at Damascus, which menaced its very life; and Moab and Edom were possessions only to be held down by force, with Syria constantly inciting them to revolt. He proved a prince of great energy and ability; twice he drove back Benhadad of Damascus and he held down Moab with a strong hand, crushing a wholesale insurrection, as proved by the inscription on the Moabite Stone (q.v.); he made the kingdom of Judah an ally and perhaps a vassal, and gained at least the neutrality and perhaps some of the resources of the kingdom of Tyre by marrying the Princess Jezebel. Unfortunately this involved letting her establish the worship of the Tyrian Baal, called Melkart, and made the extremists of the Yahwé priesthood his irreconcilable enemies and defamers. Yet he was no deserter of Yahwé, but merely a cool politician, who felt that his first duty to his country and even to its national religion was to save it from absorption in Syria, which would end Israel and the Yahwé cult at once; and 400 priests of Yahwé prophesied before him previous to his last campaign. His entire internal policy has been blackened by the affair of Naboth's vineyard, and Jezebel is a name of execration. Certainly the judicial murder was a great crime, but it shows at least that even an Oriental monarch 2,750 years ago could not expropriate an obstinate holder by sheer violence; defiance of royal orders was not as safe to let go for a precedent then as now and more than one king has had his hand forced by his queen. Nor in fact did these things prejudice the larger interests of his reign. In 854 we find him strangely allied with his old enemy Ben-hadad against Shalmaneser (q.v.) of Assyria, though one would suppose he would gladly have seen Benhadad crushed, and Assyria was no immediate danger; possibly he was menaced from other quarters and dared not refuse. At any rate, Shalmaneser inflicted a crushing defeat on the allies at Kargar near the Orontes in 854 and Ahab recovered liberty of action if he had lost it; for the next year he engaged in a new campaign against Ben-hadad, in alliance with Jehoshaphat, King of Judah, and was killed in

battle. The Biblical narrative is taken from two opposed sources; one embodying the popular tradition of Ahab as a brave, capable and popular king, the other the priestly view of him as a bad man and monarch. His contest with Elijah (1 Kings xvii–xix) is a picturesque rendering of the latter.

AHASUERUS, a-hăz'ū-ē'rŭs, Scripture history, a king of Persia, the husband of Esther, to whom the Scriptures ascribe a singular deliverance of the Jews from extirpation, which they commemorate to this day by an annual feast, that of Purim, preceded by what is called the fast of Esther. Different opinions have been entertained as to which of the kings of Persia mentioned in other historical books may be the Ahasuerus of the Bible. He is probably the same as Xerxes. Ahasuerus is also a Scripture name for Cambyses, the son of Cyrus (Ezra iv, 6) and for Astyages, King of the Medes (Dan. ix, 1). The word Ahasuerus is merely the Latin form of the Hebrew Ashashverosh and is believed by some to be a transcription of the Persian Khshayarsha ("venerable king") and this name may be reasonably supposed to have been originally an appellative, so that its application by foreigners, like the Jews, to different royal personages is explained.

AHAVA, ā-hā-vā, the name of a stream and a district or town in Babylonia, mentioned in the book of Ezra. The river was probably one of the canals of the Euphrates near the city of Babylon. On its banks Ezra assembled his company and camped for three days before returning to Jerusalem. The site and the river still remain unidentified although many conjectures have been made. In the apocryphal book of First Esdras the name is given as Theras.

AHAZ, the 12th King of Judah, succeeded his father Jotham, 742 B.C. Forsaking his father's religion, he gave himself up so completely to idolatry that he is said to have caused his own son to pass through the fire to Moloch, and plundered the temple to obtain presents for Tiglath-pileser, King of Assyria, whose assistance he desired to obtain. His powerful ally freed him from his most formidable foes by invading Syria, taking Damascus, killing Rezin, the King, transporting the inhabitants of Kir, thus putting an end to the Syrian kingdom of Damascus, and by stripping Israel of the whole country east of the Jordan.

AHAZIAH, two kings referred to in the Bible. The first was the son and heir of Ahab, and the 8th King of Israel, from 851 to 849 B.C. On assuming power the Moabites refused to pay tribute, but before he could march against them he fell from a window of his palace and was badly injured. He sent messengers to the god Baal Zebub of Ekron to consult him in regard to his injuries, but the messengers were met by Elijah, the Prophet of Yahwé, who sent them back with the information that the King would die. He was succeeded on the throne by his brother Joram. The second Ahaziah referred to was the son of Jehoram and of Arab's daughter, Athaliah, the 6th King of Judah. In 2 Chron. xxi, 17 he is called Jehoahaz and in 2 Chron. xxii, 6 Azariah, which is an error of transcription, as indicated by the Greek version. With his uncle, Jehoram, he served in the latter's campaign against Hazael, King of Syria. Later he was slain by Jehu, after having been on the throne only a year.

AHIKAR, ā-hē-kar, the vizier of Sennacherib. The story of Ahikar has recently been published. Scholars claim for it a greater antiquity than that of the Book of Tobit or the Book of Daniel. Both seemed to have borrowed from it. Ahikar being childless, adopted a boy named Nadan and treated him as his own son. He was not worthy of the care lavished upon him. He forged treasonable letters in Ahikar's name, thus procuring Ahikar's condemnation to death. The executioner spared him but imprisoned him. In time he was restored to royal favor and Nadan delivered to him for punishment. The text of the story is in a volume issued from the Cambridge University Press (1898). In condensed form the reader is referred to the *American Journal of Semitics* (Vol. 16).

AHITH'OPHEL, privy counselor to King David, native of Giloh, in Judæa and supposed to be the grandfather of Bathsheba. He was implicitly trusted by David and Absalom and joined the latter when he revolted. It was he who advised Absalom to take possession of David's throne and concubines. In despair because Absalom took other advice than his, he went home and hanged himself.

AHMADABAD, ä'mą-dą-bäd', chief town in the district of the same name, in the presidency of Bombay, India. It is situated on the banks of the river Sabarmutti, 309 miles north of Bombay. It was founded in 1412 by Ahmed Shah. In 1818 it came under British rule. It has always been the centre of the skilled handicrafts, being famous for the manufacture of silk fabrics, objects of the goldsmith's art and pottery. It is now also the centre of a big trade in cotton, indigo and opium. The Jumna Masjid, a magnificent mosque, shoots its two lofty minarets above the centre of the city. Here too is the mosque of Sujaat Khan and the modern Jain temple of Seth Hathi Sinh. The city walls, once a very complete system of fortifications and later fallen into ruins, were restored in 1834. Ahmadabad has now a modern system of water works installed and contains quite a number of educational institutions, the most important of which is the Rat Guza College. The population is estimated at a little over 216,000.

AHMED FUAD, 2d Sultan of Egypt: b. 1868. He is the youngest son of the Khedive Ismail Pasha, and succeeded his brother Hussein Kamel (q.v.) on the death of the latter in October 1917. He received most of his education in Italy and is regarded as a broad-minded and progressive ruler. Always noted for his consistently friendly attitude toward the British connection, he is expected to pursue the same steadfast and loyal policy as his predecessor. He is strongly interested in all matters of national importance, particularly education and agriculture. He is the eighth descendant of Muhammad Ali, the founder of the dynasty, and has two brothers and three sisters living.

AHMED MIRZA, äh'mĕd mir'zā, Shah of Persia: b. Tabriz, 8 Jan. 1898. He is the son of Mohammed Ali, whom he succeeded on the

Persian throne when the latter was deposed, 16 July 1909. Although not the eldest son, his father nominated him heir-apparent because the mother of his eldest son was not of the Jadjar, or royal, house.

AHMED, Prince, hero of one of the Arabian Nights tales. The fairy Pari-banou gives him a tent large enough to shelter an army, yet so fine in texture that it could be folded up and hidden in one's pocket. She also presented him with the apple of Samarcand, which insured its possessor perennial good health.

AHMEDNAGGAR, ä'mĕd-nŭg'ŭr, an important town in British India, presidency of Bombay, 122 miles east of Bombay, on a branch of the Great Indian Penninsular Railroad. It was founded in 1494 by Ahmad Nizam Shah. During the reign of his son, Boorhan Nizam Shah, it reached a high degree of prosperity, but the political anarchy following his death brought about its decay. In 1797 it fell into the hands of the Mahrattas, but in 1803 was taken by General Wellesley. The town has increased in size and prospered since coming into British possession. It is noted for the curious defense works that have been laid about it, walls consisting of prickly pear hedges 20 feet high, so full of sap that no fire can burn them and so thick that it is impossible to force a way through. Some fine pieces of native architecture still survive the past glories of the town. It has a modern water supply, brought in by means of aqueducts. The population is about 43,000.

AHMED SHAH, äh'mĕd shä, 1st Ameer of Afghanistan: b. 1724; d. 1773. He was a chief of the Abdali tribe, but later extended his sway over the other chieftains by taking advantage of their feuds. He thus liberated them from the dominion of Persia and founded the Douranee dynasty. He became noted for his wealth, among which was included the famous Kohinoor diamond. In 1748 he captured Lahore and Kashmir and in 1756 defeated the Great Mogul and sacked Delhi.

AHMED TEWFIK PASHA, Turkish diplomat and statesman: b. 1843. Having served in the army some years he was sent to Athens as minister in 1882, to Berlin as ambassador in 1884, then became minister of foreign affairs in 1895, holding this office until 1899. Under the Young Turk régime he was again minister of foreign affairs, becoming grand vizier for a short time in 1909.

AHRENS, Carl, Canadian landscape painter: b. Winfield, Ont., 15 Feb. 1866. A Norseman by descent, he studied art under William Chase, Edwin Ellwell and George Inness of New York. One of his pictures, 'The Day is Done,' received much favorable notice at an exhibition of the Ontario Society of Artists in 1890; another, 'The Fisherman's Child,' was given the place of honor in the biennial exhibition of the Royal Canadian Academy in 1893; and still another, 'Ripe Corn Time,' was purchased by the Ontario government to hang in the Parliament buildings, Toronto 1896. Afterward he attracted the attention of Elbert Hubbard, who was greatly impressed by his originality in atmospheric effects, and persuaded him to throw in his lot with the Roycroft Community at East Aurora, N. Y.; separating from them he spent three years painting the ruins of the old Spanish missions in southern California. He returned to Canada in 1907. His distinguishing traits are his feeling for color and his handling of the problems of light and air. His composition is always simple and effective; there is, however, no real resemblance to any other than himself; his style is an amalgam absolutely his own. In addition to the works mentioned above the following are well known: 'Cradled in the Net,' 'The House in the Clearing,' 'Gleam on the Woodlands,' 'The Woodcutters,' 'The Glow in the Woodland,' 'Passing Showers' and 'The Coming Storm.' He is also a writer of short stories for the periodical press.

AHRENS, ä'rens, Franz Heinrich Ludolf, German classical philologist: b. 1809; d. 1881. For 30 years, from 1849 to 1879, he was director of the Lyceum at Hanover, and became known as an authority on the scientific study of Greek dialects. His principal work, an important standard treatise, is 'De Græcæ Linguæ Dialectis' (1839–43; new ed. by Meister, 1882–89).

AHRIMAN, ä'rĭ-măn, the devil of the ancient Zoroasterian religion. He is the head spirit of all the sources of evil. Under him are hordes of other evil spirits, but next to him come the six arch-demons, chief of whom is Aeshma.

AHUACHAPÁN, ä'oo-ätch'ą-pän, a department of the Republic of El Salvador. It is divided into two districts, the first of which includes the departmental capital (pop. 15,000), also called Ahuachapán, together with Apaneca, Ataco, Jujutla, Guaimango, San Pedro Pustla and Tacuba (in all 48,840 inhabitants), and the second district embraces Atiquizaya, San Lorenzo, Turin and Refugio (all told 15,168 inhabitants). It is bounded on the north and northwest by Guatemala, on the east by the departments of Santa Ana and Sonsonate, and on the south and southwest by the Pacific Ocean. The climate is considered healthful, the agricultural products are uncommonly varied, and in commerce and industry this department takes the leading position in the republic. Total pop. 64,008. See SALVADOR, EL.

AIBONITO, ä'bŏn-ēto, Porto Rico, capital of a municipality of the Guayama electoral district, 25 miles northeast of Ponce. Coffee and tobacco are cultivated in the neighborhood, and the town, located over 2,000 feet above sea-level in a cool and healthful situation, is the seat of an acclimatizing station and sanatorium for visitors. Pop. of municipality, 8,600; of town, 2,100.

AICARD, ā'kär', Jean François Victor, French author: b. Toulon, 4 Feb. 1843. Many of his works are extremely popular and he is especially noted for his finished style. He was elected member of the French Academy in 1909. Among his later works are 'Poèmes de Provence' (1874); 'La chanson de l'enfant' (crowned by the Academy 1876); 'Miette et Noré' (1880); 'Lamartine' (1883); 'Jésus' (1896–1912); 'Tata' (1901–10); 'L'âme d'un enfant' (1903). His plays: 'Legende du cœur' (1903); 'Benjamine' (1906); 'L'illustre Maurin' (1908); 'Maurin des Maures' (1908); 'Hollande; Algére' (1913).

AÏDA, grand opera in four acts by Guiseppe Verdi (libretto by Camille du Locle and

Antonio Ghislanzoni), first produced at Cairo, Egypt, on 24 Dec. 1871. Verdi was in his 59th year at the time, but, as the event showed, not yet in the full maturity of his powers. He was still later to astound the musical world with 'Otello' and 'Falstaff'— the latter a unique exhibit of the ultimate flowering of genius. Aïda typifies Italian opera at its best. Never has there been a richer or more breathless outpouring of melody that carries the listener on its very crest from beginning to end. Written to order and for an honorarium of six figures, the work defies tradition in its spontaneity and torrential vigor. The libretto, founded upon a *motif* of ancient Egyptian history, affords full scope for brilliant pageantry, contrasted scenic effects and emotional intensity. Rhadames, the warrior hero, betraying his country for love of the captive Ethiopian princess, Aïda, Amneris, daughter of the King, whose love for Rhadames is unrequited, Amonasro, the enemy King, energized by undying hate of his successful adversary, and Ramfis, the vengeful high-priest, are all operatic characters in the finest sense. The music individualizes them in a masterly way. Local color is used sparingly, but the composer's richly flowering fancy endues the pages with glowing, sensuous colors, admirably contrasted with impressionistic mood-painting, as in the famous Nile scene, with its pale moon-tinted flute introduction. Verdi's orchestra becomes a far more expressive instrument than ever before. It rarely dominates the voices, but the accompaniment is never stereotyped and it always adds dramatic point to the scene. There are many instances, too, of matchless skill in the handling and the language is eloquent throughout. Among the finest numbers in the opera — selection is difficult — may be mentioned the opening tenor romance, Celeste Aïda, the pompous but brilliant finale of the second act, full of varied contrasts, brought to an intensely dramatic close, the judgment scene with its solemn pauses and the final love duo, O terra addio, blending with the overhead strains of the sacred dance of the priestesses and Amneris' final wail.

With all the remarkable development of music in the last four decades, Aïda has remained as fresh and as vivid as when it was first produced. Its influence on modern Italian opera is unmistakable, its pages a constant source of inspiration to Verdi's successors.

LEWIS M. ISAACS.

AIDE-DE-CAMP. An officer who may be regarded as a kind of superior confidential attendant upon a general in active service. He carries all orders from the general in command to the commanding officers of the various arms and divisions on the field of battle; these he is to deliver in the plainest terms, so as to be distinctly understood; and when so understood, the orders are to be as implicitly obeyed as if the general himself were present and speaking. Wherever possible such orders must be delivered in writing. As an example of the importance of this matter may be adduced the brilliant but disastrous light-cavalry charge of the British at Balaklava in 1854. An aide-de-camp also acts as secretary to the general and assists him in his correspondence when he has not specifically a military secretary. He aids likewise in dispensing the courtesies of the general's house or tent. Aides-de-camp vary in number according to the rank of the general officer. In the United States a lieutenant-general is allowed to have two aides (lieutenant-colonels) and a military secretary; a major-general, three aides (either captains or lieutenants); and a brigadier-general two aides (lieutenants). Before an officer below the rank of major can receive such appointment he must have served at least two of the six preceding years with his troop, battery or company. The appointment is for four years and may not be exceeded. In the British service, before an officer can be appointed as aide-de-camp, he must have been two years with his regiment and must pass an examination.

AIDIN, ī-dēn, Turkey in Asia, capital of a sanjak of the same name, in the vilayet of Smyrna, on the classic river Meander, 70 miles by rail southeast of Smyrna. It is noted for the beauty of its situation, its tree-shaded streets, its churches, synagogues and mosques, the ruins of the ancient Tralles or Guzel-Hissar and for its interesting history. A large transit trade is carried on in cotton, figs, dates, raisins and important candy and leather manufactures. Pop. 35,000.

AIGRETTE, ā'grĕt, a French word, used to denote the down, or plume, that is attached to many vegetable seeds, as the thistle or the dandelion. It is also used in reference to the feathery tufts found on the heads of some birds, as the heron and the egret, whence the term came also to cover a tuft of feathers employed as an ornament in a woman's headdress. More specifically it means such an ornament of egret plumage, the long, slender white feathers that spring from the back of the egret during the breeding season and for which these birds have been much hunted. As the feathers cannot be procured without killing the bird, thus causing the death of the nestlings, the result has been that it has become more and more rare and now threatens to become extinct. To protect the birds their feathers are prohibited from importation into the United States.

AIGUES-MORTES, ĕg'môrt, France, town in the department of Gard, 25 miles by rail southwest of Nimes. Isolated amid the salt marshes of the Rhone delta, three miles from the Mediterranean with which it communicates by a canal, it is remarkable for the fine mediæval fortifications, crenellated walls, bastions and towers surrounding the town. These were begun by St. Louis IX who sailed from here in 1248 and again in 1270 for the seventh, and the eight crusade in which he lost his life. The fortifications were completed under Philip III. Trade is carried on in oranges, fruits, wine and coal and the manufacture of soda, fishing and the entertainment of tourists are the chief industries. Pop. 4,000.

AIGUILLON, dā'gwē'yŏn', **Armand de Vignerot Duplessis Richelieu**, DUC D', French statesman: b. 1720; d. 1782. In 1754 he became governor of Brittany. His administration of the province was so bad that he brought upon himself the condemnation of the Parliament of Rennes. But his friendship with Madame du Barry, the mistress of Louis XV, not only saved him from punishment but was the influence

which caused his appointment as minister of foreign affairs, in 1771. But so incompetent was he that even the complacent monarch could no longer tolerate him, and after serving in office three years he was removed.

AIGUILLON, Marie de Vignerot, DUCHESSE D': b. 1604; d. 17 April 1675. In 1620 she was married to the Marquis de Combalet, and after his death in action in 1622 she devoted her time and fortune to works of piety and charity. Her interest was aroused in the Jesuit mission to Canada by Father Le Jeune's 'Relation' of 1635, and in 1639 she founded the Hotel Dieu at Quebec, entrusting it to Augustinian nuns from Dieppe.

AIGUN, Convention of (1858), between Russia and China, by which the former obtained all the territory eastward of the Ussuri River to the Japan Sea, and fixed her southern boundary at the frontier of Korea.

AIHUN, ī'hūn, or **AIGUN,** China, town of northern Manchuria, of historical importance, owing to the Aihun treaty effected here by Count Muraviev in May 1858, by which the left bank of the Amur was ceded to Russia. An active transit trade is carried on in grain, flour, mustard, tobacco and oil. Pop. 20,000. See AIGUN, CONVENTION OF.

AIKEN, Charles Francis, American educator: b. Boston, Mass., 8 April 1863. He was educated at Harvard University, St. John's Theological Seminary, Brighton, Mass., and the Catholic University, Washington, D. C. In 1884–86 he was teacher of the classical languages in Heathcote School, Buffalo, N. Y., from 1892 to 1895 was engaged in parish work, studied abroad for the next two years, and in 1897 was appointed instructor, in 1900 assistant professor, in 1906 ordinary professor of apologetics at the Catholic University, Washington. He was dean of the faculty of theology in 1909, 1911 and since 1913. In the latter year he lectured at the Catholic Summer School, Cliff Haven, N. Y. He is a member of the Advisory Council of the Simplified Spelling Board, is a contributor to the Catholic University *Bulletin,* the *American Ecclesiastical Review,* the *American Catholic Quarterly Review* and has published 'The Dhamma of Gotama the Buddha and the Gospel of Jesus Christ' (Boston 1900; French trans., Paris 1903).

AIKEN, William, American congressman: b. Charleston, S. C., 1806; d. Flat Rock, N. C., 7 Sept. 1887. In 1825 he was graduated from the College of South Carolina. Having been elected, in 1838, to the State legislature he served his term and was then, in 1844, elected governor of South Carolina. In 1851 he was sent to Congress as democratic representative, where he remained for six years and was short only one vote from becoming Speaker of the House of Representatives. He opposed secession, and after the end of his term he retired from politics, until 1866, when he was again elected to Congress but was not admitted to a seat. Aiken, S. C., is named for him.

AIKEN, S. C., city and county-seat of Aiken County, on the Southern Railroad, 17 miles northeast of Augusta, Ga., and 120 miles northwest of Charleston. It is one of the most picturesque and attractive towns in the United States, being located at an elevation of 600 feet above the sea, in the midst of numerous pine forests. The dryness of the atmosphere and the comparative mildness of the climate have combined to make Aiken the most noted health resort in the South. The town is the centre of a large and important agricultural district and does a thriving cotton trade. There are also artificial stone works, planing and lumber mills. There is located here the Aiken Institute; St. Angela's Academy for white students; the Schofield Normal and Industrial School and the Robertson Training School for colored youth, and several private schools and academies for both sexes. Many Northern families of wealth and culture have winter homes here. Aiken was first incorporated in 1835, and is governed by charter, secured in 1890 and revised in 1897, which provides for a mayor elected every two years, and a city council composed of the mayor and six aldermen. The town officials are elected annually at town meetings. The water supply and sewerage system are controlled by the town. There are two national banks here, numerous large hotels, a number of manufactories and several newspapers. Pop. about 5,000.

AIKIN, JOHN, English physician and miscellaneous writer: b. 1747; d. 1822. He attained considerable popularity by 'Evenings at Home' (6 vols. 1792–95), instructive reading for the family circle which were translated into almost every European language, and which he issued in collaboration with his sister Mrs. A. L. Barbauld. His 'General Biography' (10 vols., 1799–1815), was another important work. His daughter, AIKEN, LUCY, b. 1781; d. 1864, was the author of court memoirs of 'Queen Elizabeth' (1818); 'James I' (1822); 'Charles I' (1833), which had considerable vogue. She also wrote 'Lorimer,' a novel (1814), and a 'Life of Addison' (1843).

AIKINITE. See NEEDLE ORE.

AIKINS, SIR James (ALBERT MANNING), Canadian lawyer and administrator: b. Grahamsville, Peel County, Ontario, 10 Dec. 1851. He was educated at Upper Canada College and Toronto University, where he was graduated in 1875. He was called to the Ontario bar in 1878, and settled in Winnipeg in 1879. He represented Brandon in the Conservative interest in the House of Commons 1911–15, and resigned to lead his party in the provincial elections for Manitoba, in which they suffered defeat. In 1916 he was appointed lieutenant-governor of Manitoba. He was knighted in 1914, and was president of the Canadian Bar Association, 1914–15.

AILANTHUS, a genus of trees of the family *Simarubaceæ,* including eight or nine species of central and southern Asia and northern Australia. The trees have large deciduous pinnate leaves and small greenish flowers in large panicles, followed by flat-winged fruits. *A. glandulosa,* the Tree of Heaven, the best known species, is common in cultivation in the United States and in some places has run wild. It is better able to endure smoke and dust than most trees and has few enemies. The trees are short-lived and are somewhat objectionable because of their malodorous flowers, the pollen of which is said to cause catarrhal troubles.

AILLY, a'yē,' **Pierre d'** («Petrus de Allaco»), French cardinal and philosopher surnamed «the eagle of France and the indefatigable hammer of heretics»: b. at Compiègne 1350; d. at Avignon 1420. Distinguished as a preacher and philosophical disputant, he led an active and diversified life mainly devoted to the promotion of church unity and the healing of the papal schism. He was made cardinal by John XXIII and was appointed papal legate to Germany. He was a prolific author and among his writings are 'Concordantia Astronomiæ cum Theologia'; and 'Imago Mundi'; the latter of American significance as in it he writes of the possibility of reaching the Indies by sailing west, citing as authorities Aristotle, Pliny and Seneca. Columbus' personal copy of d'Ailly's 'Imago Mundi' now in the Columbine library at Seville has numerous marginal notes in the navigator's own handwriting, and Las Casas in his 'Historia de las Indias' (Vol. I, xi, 89) states that of all «modern writers d'Ailly exercised the greatest influence on the realization of the plans of Columbus.»

AILSA CRAIG, āl'sa krāg, Scotland, a remarkable rock islet, at the mouth of the Firth of the Clyde, off the west coast of Ayrshire. Scarcely two miles in circumference, it rises precipitously to a height of 1,114 feet. On the northern side is a columnar basalt cave. The rock is the chief source of supply for «curling» stones, which are popularly called «Ailsa Craigs» or «Ailsas.» The rock is immortalized in literture, notably in Keats' fine sonnet (1818).

AIMARD, ā'mär', **Gustave,** French-American novelist: b. 1818; d. 1883. His real name was Olivier Gloux and he became known as the «French Fenimore Cooper.» After a voyage to America as a cabin-boy he spent an early adventurous life for 10 years among Indians in Arkansas and Mexico. He afterward traveled as a soldier of fortune in Turkey, the Caucasus and Spain, served as an officer of the Garde Mobile in the Paris revolution of 1848, and as commander of the «francs-tireurs of the press» in the Franco-German war 1871–72. Based on his varied experiences he wrote numerous novels, many of which have been translated into English. The best are 'Les trappeurs de l'Arkansas' (1858); 'Le grand chef des Incas' (1858); 'Les pirates de la prairie' (1859); 'Le grand filibuste' (1860); 'Nuits mexicaines' (1863); 'L'Araucan' (1864); 'La forêt vierge' (1870); and 'Les sappeurs blancs' (1873).

AIN, ăn' administrative department of the French government, on the French and Italian frontiers. In the south and west the country is marshy, but in the north are the Jura Mountains, much frequented by foreign tourists. The soil produces bituminous limestone. The area is about 2,250 square miles and the population 342,482. The chief town is Bourg.

AINGER, ān'jĕr, **Alfred,** English clergyman and author: b. London, 9 Feb. 1837; d. 8 Feb. 1904. In 1887 he was appointed a canon in Bristol Cathedral; in 1894 he became master of the Temple, London; chaplain-in-ordinary to Queen Victoria in 1896; and to King Edward VII in 1901. He was distinguished by an attractive personality, by wit and humor; and became well known as an authority on Charles Lamb, Crabbe and Thomas Hood. His chief works are 'Poems of Thomas Hood' (with biographical introduction, 1897); 'The Life and Works of Charles Lamb' (12 vols., 1899–1900); 'Crabbe' (1903); 'The Gospel and Human Life' (1904); 'Lectures and Essays' (2 vols., 1905).

AINMULLER, īn'mool'er, **Maximilian Emmanuel,** German artist, founder of the modern school of stained glass painting: b. Munich, 14 Feb. 1807; d. 9 Dec. 1870. After studies in architecture and decoration, he became designer in the royal porcelain manufactory at Nymphenburg and later inspector and head of the royal manufactory of stained glass at Munich. Among his master works are the windows representing St. Peter and St. Paul in the Vatican at Rome; windows in the cathedrals of Cologne, Glasgow, St. Peter's College, Cambridge, St. George's Chapel, Windsor, St. Paul's Cathedral and Westminster Abbey, London.

AINO, ī'nō, or **AINU,** sometimes called the «hairy Ainus,» people of northern and eastern Yezo, on the Island of Saghalien and the southern Kuriles, numbering in all about 18,000. They are supposed to be the descendents of the original inhabitants of the Japanese archipelago. They differ very much in appearance from the present inhabitants of Japan, especially in the heavy beards of the men. Their language resembles the Japanese in structure, but differs radically in vocabulary. Authorities differ widely in their theories regarding the origin of the Ainu, one of them being that they were a small branch of the Caucasian, or white, race, which was driven out into the archipelago by the Mongols. Consult Batchelor, 'The Ainu and Their Folk Lore' (London 1901); Chamberlain in the *Journal of Race Development* for 1912–13.

AINSWORTH, ānz'würth, **Fred Crayton,** American soldier: b. Woodstock, Vt., 11 Sept. 1852. He was appointed first lieutenant and assistant surgeon, U.S.A., in 1874; major and surgeon 1891; colonel and chief of Record and Pension Office in 1892, where he devised and introduced many important improvements in the business methods of the War Department and the army and completed the compilation and publication of the 'Official Records of the Union and Confederate Armies.' In 1899 he received the rank of brigadier-general. In 1904 he became the military secretary of the army with the rank of major-general, and in 1907 the adjutant-general of the army with the same rank. In 1912 he was retired from active service, at his own request, after more than 37 years' service.

AINSWORTH, William Harrison, English novelist: b. 4 Feb. 1805; d. 3 Jan. 1882. He was the son of a Manchester solicitor. He wrote 'Rookwood' (1834); 'Jack Sheppard' (1839); and about 40 other novels, including 'Guy Fawkes,' 'Tower of London,' 'Windsor Castle,' 'Lancashire Witches,' 'Flitch of Bacon,' etc.

AINTAB, īn-täb, Turkey in Asia, town in the villayet of Aleppo, on the southern foothills of Mount Taurus and on the right bank of the river Sajur; 70 miles northeast of Aleppo. Its strong mediæval castle Hamtab is the seat of an important military station. There is an active trade in the tobacco, grain and fruits of the region, and in the local manufactures of

cotton goods, striped cloths and pekmez conserve made from grapes; also in "Hittite" antiquities from ancient Doliche, the site of the cult of Baal, to the northwest. Aintab is the seat of American, Anglican and Franciscan missions. Pop. 45,000.

AINU. See AINO.

AIR, the gaseous substance that envelops the earth and forms its atmosphere. (See ATMOSPHERE). It consists almost entirely of the gases oxygen and nitrogen, which are merely mixed and not chemically combined; but in addition it contains many other substances in small amounts, among which are water-vapor, carbon dioxide, nitric acid, ammonia, ozone, argon, neon and organic matter, as well as dust, germs and other solid particles held in suspension. In certain localities other components may occur. Near the sea, for example, salt can always be detected in it, and over the land it contains sulphates in small amounts. The quantity of water-vapor present in air varies greatly with time and place, and in all analyses and statements of its composition the water-vapor is supposed to have been removed first. The quantity of carbon dioxide is subject to considerable variation also. It is very constant in the open country, where it constitutes about 0.043 per cent (by weight) of the air; in cities the percentage is higher, rising to 0.07 and occasionally to 0.10. In crowded rooms, especially where artificial lights are burning, the quantity of carbon dioxide present may be even greater than this. In country air the percentage of carbon dioxide is subject to a diurnal change amounting to about one-eighth of its total amount, more being present at night than in the daytime. This is undoubtedly due to the fact that plants absorb the gas by day and exhale it during the night. The proportion of nitrogen and oxygen in air is subject to variation also, though within much narrower limits. In general, 100 volumes of air contain about 21 volumes of oxygen and 79 of nitrogen. Regnault analyzed air collected in different parts of the world, and found that the volume-percentage of oxygen in the air of Europe varied from 20.903 to 21.0 per cent. The average of 17 samples collected from over the Arctic seas gave 20.91 per cent. Regnault was of the opinion that sea air contains slightly less oxygen than land air; but Lewry considered that no distinct difference could be proved except in the tropics, where sea air exhibited a slight diurnal variation. Argon constitutes about 1 per cent of air, and neon about 0.001 per cent. The nitric acid present in the air is so small in amount that it can be detected only in rainwater, by which it is dissolved and brought down. It is very likely formed partly by the direct combination of oxygen and nitrogen under the influence of electric discharges, and partly by the action of ozone upon ammonia. The quantity present is greatest in summer and least in winter. The ammonia of the air occurs partly as carbonate and partly as nitrate. Its amount is exceedingly variable, ranging from 0.1 to 135.0 parts (calculated as carbonate) in 1,000,000 parts of air, the average amount being perhaps 6. The amount present decreases during a heavy rain, but within a few hours it returns to the normal amount again. No ozone can be detected in city air, and air over marshes and in malarial regions contains very little of it. Normal country air contains not more than one volume of this gas to 700,000 of air. It is more abundant in summer than in winter, and is most noticeable during thunderstorms and heavy winds. In the laboratory ozone is produced by the action of electric discharges upon oxygen, and it is probably produced in the air in the same way. Hydrogen peroxide has been detected in the air, and some authorities consider that it may be present in greater abundance than ozone, and that it may sometimes be mistaken for ozone. (For further information on the composition of the air, see Angus Smith's 'Air and Rain'). According to Regnault, one cubic centimetre of air that has been freed from water-vapor, carbon dioxide, and ammonia, weighs 0.0012932 gramme when the air is at the temperature 0° C., and under a barometric pressure of 760 millimetres of mercury at Paris (lat. 48° 50′ N.), and at a height of 60 metres above the sea. In English equivalents this means that at ordinary atmospheric pressure and at the temperature of melting ice (32° F.) a cubic foot of air weighs 0.080681 pound; "ordinary atmospheric pressure," signifying the pressure that would be exerted by a weight of 14.7 pounds, resting upon a base one inch square at sea level in the latitude of Washington. When a mass of air, originally at atmospheric pressure and at the freezing-point (32° F.), is heated to the boiling-point (212° F.) without changing its volume, its pressure becomes 1.36728 atmospheres according to Balfour Steward, or 1.36706 according to Wiebe and Böttcher. The average of these is 1.36717, which agrees well with the value 1.36719 as given independently by Morley and Miller. The older estimates of Regnault and Magnus are probably too small. The specific heat of air (the pressure being kept constant) is 0.2375 according to Regnault, and 0.2389 according to Wiedemann. The specific heat (the volume being kept constant) is 0.1715 according to Joly's direct measurement with the steam calorimeter. Air cannot be liquefied by any pressure whatever so long as its temperature is higher than about 220° F. below zero (−140° C.); but if it be first cooled to a temperature slightly below this it condenses to a liquid upon the application of a pressure of 39 atmospheres. (See CRITICAL POINT). If it be cooled to a temperature materially lower than 220° F. below zero, it can be liquefied by a correspondingly smaller pressure. Liquid air is opalescent at first, probably from particles of solid carbon dioxide held in suspension. These can be separated by filtration, or they will rise to the surface in a short time, leaving the clear, transparent air beneath. When liquid air is exposed in a glass vessel it absorbs heat rapidly from surrounding objects, and boils actively until it has entirely evaporated. The nitrogen that it contains evaporates faster than the oxygen, however, and the liquid remaining in the vessel becomes increasingly rich in oxygen until toward the last it consists almost entirely of that gas. Liquid air may be frozen to a clear, transparent solid by surrounding it with liquid oxygen and then forcing the evaporation by means of an air-pump. Liquid air is of great interest to the physicist for many reasons; but its importance in the arts has been grossly ex-

aggerated. In particular, the process that is put forth from time to time, to utilize liquid air for running a motor that shall condense more liquid air than it consumes, is impossible of realization, because although such an action would not necessarily imply perptual motion it would violate the second law of thermodynamics. (See THERMODYNAMICS). If liquid air is confined and allowed to become warm through the absorption of heat from its surroundings its expansion gradually generates an enormous pressure. This fact, together with the safety with which liquid air can be handled, has led to its use to a limited degree for blasting in tunnels and mines, where the presence of the irrespirable products of combustion of ordinary explosives is objectionable; but even this application has been discontinued, owing to certain grave and apparently insuperable practical difficulties that were encountered. See LIQUID AIR.

The scientific study of the air has been much stimulated in recent years by the establishment of the Hodgkins Fund. In October 1891 Mr. Thomas George Hodgkins of Setauket, N. Y., made a donation to the Smithsonian Institution, the income from a part of which was to be devoted to the "increase and diffusion of more exact knowledge in regard to the nature and properties of atmospheric air in connection with the welfare of man." The first prize of $10,000 from this fund was awarded on 6 Aug. 1895 to Lord Rayleigh of London, and Prof. William Ramsay of University College, London, for their discovery of the previously unknown element argon in the atmosphere. (See ARGON). A prize of $1,000 was also awarded at the same time to Dr. Henry de Varigny of Paris, for his 'L'Air et la Vie' ("Air and Life"), which was considered to be the best treatise upon atmospheric air, its properties and relationships. Further information concerning the Hodgkins Fund may be had from the Smithsonian Institution, Washington, D. C. For information concerning dust and germs, consult Tyndall's 'Fragments of Science,' and Dr. T. Mitchell Prudden's 'Dust and Its Dangers.'

Dephlogisticated Air, in the old chemistry, was air that had been deprived of phlogiston (q.v.); in modern terminology it is called oxygen. Fixed air was Dr. Black's name for carbon dioxide, suggested by the fact that certain alkaline substances can "fix" this gas, or combine with it to produce a solid substance.

The word "air" also occurs as an element in a host of compound words. The significance of many of these is evident, but some few call for special mention and they will be found below in their respective order. See AERODYNAMICS; AEROSTATICS; AERONAUTICS; ATMOSPHERE; BAROMETER.

ALLAN D. RISTEEN.

AIR, in music (in Italian, *aria*), means a continuous melody in which some lyric subject or passion is expressed. The lyric melody of a single voice, accompanied by instruments, is its proper form of composition. The word also designates the entire composition in such expressions as "national air," "operatic air," etc. In the 16th and 17th centuries the word was used in England to denote a lively, cheerful strain. It is fast becoming obsolete as a technical term synonymous with *aria.* Many of the Italian airs of the present, together with too great a proportion of the popular music of the day, are destitute of meaning and character. The songwriters of Germany strive to construct their airs in direct conformity to the meaning of the words. Air is also the name often given to the upper or most prominent part in a concerted piece, and is thus equivalent to treble, soprano, etc. *Arietta* signifies a short, less elaborate air than *aria,* and is designed to express a more simple and transient emotion.

AIR, ä-ĕr′, or **ASBEN,** French West Africa, an oasis of the desert of Sahara, called by Dr. Barth "the Switzerland of the desert and the frontierland of negrodom." In the north, inhabited by the savage and treacherous Tuaregs, the mountain group of Gunge rises 5,000 feet above the level of the sea. On the south a desert plateau, rising 2,000 feet, the home of giraffes, ostriches, and wild oxen, divides Air from the Sudan. Palm nuts, dates, figs, millet, senna and indigo are the chief products; camels, zebra, asses, cattle and goats are raised. The salt caravan trade to southern regions, and pilgrim caravans traveling to Mecca, are the means of commercial intercourse, yielding in tribute much of the revenue of the reigning suzerain sultan whose capital is at Agades (pop. 50,000), and of his emir who governs at Tintellust (pop. 60,000). Asben is the native designation of the region, which under the name of Air, was first described by Leo Africanus in 1526.

AIR-BATH, an apparatus designed for drying substances by exposing them to air of any desired temperature.

AIR BEDS AND CUSHIONS, often used by the sick and invalids, are composed of india-rubber, or of cloth made air-tight by a solution of india-rubber, and when required for use filled with air, which thus supplies the place of the usual stuffing materials. They tend to prevent bedsores from continuous lying in one position. They are also cheap and easily transported, as the bed or cushion when not in use can be packed in small compass to be again inflated with air when wanted.

AIR-BLADDER. See FISH.

AIR-BLAST, a stream of air, issuing from a nozzle or other aperture under pressure. Such blasts are used for throwing sand or other abrasive material against a body that is to be eroded or polished; for forcing the fires of forges or furnaces, and for burning out the impurities in pig iron in the manufacture of Bessemer steel; for removing dust from grinding-machines and saws; for cleansing woven fabrics and for multitudes of other purposes.

AIR-BLAST TRANSFORMER. This transformer is particularly well adapted to all installations where the use of oil is not permissible, or where, on account of the size of the units, self-cooling is impracticable and the cost of water required by water-cooled transformers is prohibitive. Their high efficiency at all loads, low fire risk, economy of floor space and other desirable features have resulted in a large and increasing demand for this apparatus for those installations in the foundry and arsenal in which large amounts of power must be continuously handled.

Electric transmission lines for moderate distances are usually operated at the following potentials: 2,200, 6,600, 11,000, 16,500, 22,000 and 33,000 volts. The standard lines of air-blast transformers are designed for these voltages and on account of the drop in potential on the transmission lines, taps are brought out from the high tension winding at such points that the transformers can be operated on potentials approximately 3⅓, 6⅔ and 10 per cent lower than their normal voltage. This arrangement of taps on the high tension winding permits the use of duplicate transformers at either end of transmission lines and at intermediate points, which is of great advantage in many cases, particularly on large systems.

Air-blast transformers are cooled by a forced blast of air delivered by a blower. One blower usually supplies all of the transformers in any particular station; but it is strongly recommended that a duplicate blower equipment be added. This arrangement permits one unit to be held in reserve. The transformers are generally placed above an air-chamber in which a pressure is maintained slightly above that of the surrounding air, and the blower may deliver air directly into this chamber, or, if it is more convenient, the blower can be located at a distance from the transformers, feeding into a conduit which leads to the air-chamber.

AIR-BOX, a flue or other form of conduit conveying air to or from a furnace or into a mine for ventilation.

AIR BRAKE. A brake operated through the medium of compressed air, and extensively applied to railroad trains and street railway cars. Originally this brake was devised merely as a safety device, but is now considered invaluable as a dividend-earning asset also. This latter consideration is based on the principle, that the better the brake, the higher the scheduled speed; consequently, the more frequently the car or train can traverse a given road so that fewer cars need be purchased and less labor employed. The air brake permits high scheduled speed because of the short emergency stopping distance made possible from high velocities and because a train or car may be run at high speed within a short distance of the stopping point, which is a highly important feature where stops are frequent. The first type of this appliance, designated as the straight-air, or non-automatic, brake, was invented in 1869 by the well-known American engineer and inventor, Mr. George Westinghouse. It consisted of a steam-driven, direct-acting air compressor (see Fig. 1), carried on the locomotive, which forced compressed air into a reservoir. This reservoir was connected through a three-way valve, in the engine cab, to the rear of the locomotive tender where it terminated in a flexible hose with a coupling. Throughout the length of every car a pipe was extended, with a similar hose and coupling at each end. To combine a number of cars and a locomotive into a train the respective couplings were united, making the brake pipe continuous throughout the train. The brake pipe at the rear of the train was closed by a cock. On each car, the brake pipe communicated with one face of its respective brake cylinder piston. On the other face were located brake rods and levers holding the brake shoes almost up against the treads of the car wheels. Normally the three-way valve connected the brake pipe to the atmosphere. To apply the brakes, the engineer turned the three-way valve to a position which cut off the brake pipe from the atmosphere and permitted compressed air to flow into it from the reservoir (now known as the main reservoir) on the locomotive. This air, thereupon, forced the brake cylinder pistons on each car outward, actuating the brake rods and levers, and thereby forcing the shoes against the treads of the car wheels.

Whenever the desired pressure was developed in the brake pipe, the engineer turned the three-way valve into a position (lap position) which cut off the main reservoir from the brake pipe as well as continuing to hold the communication between the brake pipe and atmosphere closed. In order to release the brakes, the three-way valve was moved into a position which cut off the main reservoir from the brake pipe and, at the same time, vented the latter to the atmosphere. This operation removed the pressure from the faces of the brake cylinder pistons and permitted the brake cylinder release springs to pull the shoes from the treads of the wheels, through the medium of the rods and levers.

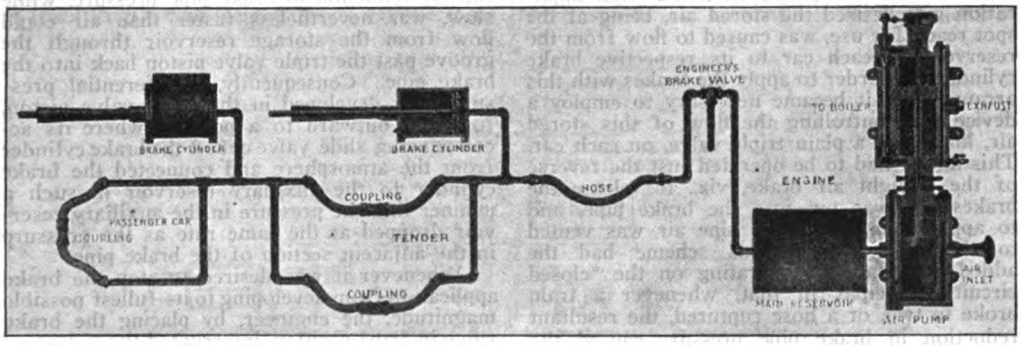


Fig. 1

This brake, while being far superior to any vehicle brake heretofore invented, required improvements in the following respects: (1) The brake pipe pressure, being higher on the front than on the rear cars during the period the brake pipe pressure was being built up, caused the rear cars to run violently into the head

cars and produced a rough stop. (2) The stop with a long train was prolonged through a considerably greater distance than with a single car because of the time necessary to transmit the required air through the long brake pipe to the respective brake cylinders. (3) For a long train, an impracticably large size main reservoir was required to fill all brake cylinders to standard maximum pressure without the assistance of the compressor. (4) In case a train broke in two, or a hose burst, the brake would be lost. This would be especially dangerous on grades.

In order to improve these conditions, Mr. Westinghouse invented the automatic brake in 1872 (see Fig. 2). With this scheme, air was stored in a reservoir on each car at a time when a brake was not required. When a brake application was desired the stored air, being at the spot ready for use, was caused to flow from the reservoir on each car to its respective brake cylinder. In order to apply the brakes with this arrangement, it became necessary to employ a device for controlling the flow of this stored air, known as a plain triple valve, on each car. This device had to be operated just the reverse of the straight air brake, viz., to release the brakes, air was put into the brake pipe, and to apply them, the brake pipe air was vented to the atmosphere. This scheme had the added advantage of operating on the "closed circuit" principle, in that, whenever a train broke in two, or a hose ruptured, the resultant reduction in brake pipe pressure caused the brakes to apply automatically. Experience with the air brake to this time indicated that two rates of applying the brakes were desirable for train control:—one, a comparatively slow rate (service rate) for ordinary use, through which the train would be stopped as quickly as consistent with the comfort to passengers and freedom from damage to lading and equipment; the other, a rapid rate (emergency rate) through which the train would be stopped at a rate as great as conditions would permit, to be used only when a short, quick stop became necessary. To utilize these new functions, the engineer's three-way valve was developed into a form designated as a brake valve. With this automatic system, as with the straight air system, compressed air was forced into the main reservoir by a compressor. Normally, however, when the train was running free over the road, the compressed air, after passing through a valve which reduced its pressure, was admitted by the brake valve into the brake pipe. The air then passing to the outer face of each triple valve piston held each in its innermost position, where this air was able to flow by the piston through a groove into a storage reservoir (auxiliary reservoir), charging it until the pressure on the two faces of the triple valve piston became balanced. In this innermost position of the triple valve piston, a slide valve, controlled by the piston, locally connected its respective brake cylinder to the atmosphere. To retard partially, or stop a train under ordinary conditions, the brake valve was moved into "service" position whereby the main reservoir air supply was cut off from the brake pipe and the air in the latter vented to the atmosphere. The rate of reduction in brake pipe pressure, while slow, was nevertheless faster than air could flow from the storage reservoir through the groove past the triple valve piston back into the brake pipe. Consequently, a differential pressure, thus developed in the triple valve piston, forced it outward to a position where its accompanying slide valve cut off the brake cylinder from the atmosphere and connected the brake cylinder to the auxiliary reservoir in such a manner that the pressure in the auxiliary reservoir dropped at the same rate as the pressure in the adjacent section of the brake pipe.

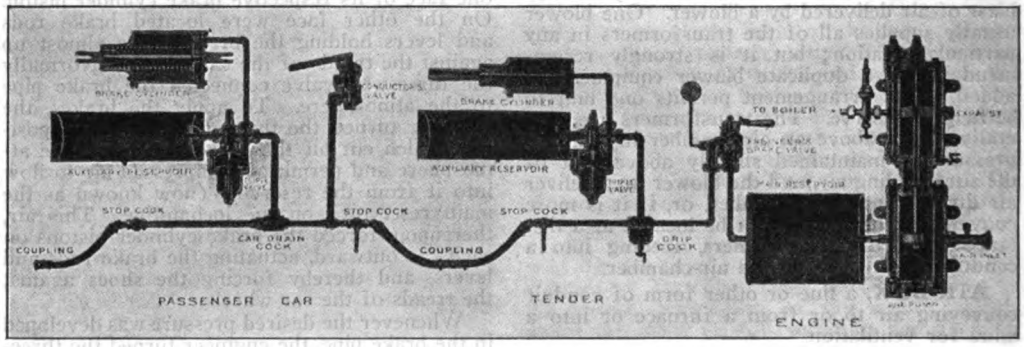


Fig. 2

Whenever it was desired to stop the brake application from developing to its fullest possible magnitude, the engineer, by placing the brake valve in "lap" position, interrupted the reduction in brake pipe pressure. The auxiliary reservoir pressure, having been reducing up to this time at the same rate as that of the brake pipe, immediately dropped slightly below the now constant brake pipe pressure, whereupon the triple valve pistons were forced slightly inward, thereby resulting in cutting off further flow of air from the auxiliary reservoirs into the brake cylinders. In releasing the brake, the brake valve was moved into "release" position where air at full main reservoir pressure was permitted to expand into the brake pipe through a large opening, in order to transmit a quick impulse through the brake pipe. The triple valve pistons were thereby forced to their innermost positions whereupon the auxiliary reservoirs were recharged and the brake cylinder air exhausted, as previously explained. After a short period elapsed, the engineer placed the brake valve in "running" position to prevent

the system from charging to a pressure higher than permitted by the reducing valve, which is operative in "running" position and is used to govern the maximum pressure carried in the brake pipe. To produce an emergency brake application, the operator moved the brake valve into "emergency" position where the brake pipe air was vented to the atmosphere through a large opening. The resultant sudden reduction in brake pipe pressure caused the auxiliary reservoir air to force the triple valve pistons and slide valves into their outermost positions where auxiliary reservoir air was admitted into the brake cylinders rapidly. This operation produced a short, quick stop. While the automatic brake with the plain triple valve made the air brake safe, and the stops quicker and shorter than with the straight air brake, yet as train lengths and weights increased, the stops again began to become rough and longer, particularly with emergency applications.

This condition led Mr. Westinghouse to invent the quick action triple valve (Fig. 3) in 1887, which, in assuming "emergency" position, locally reduced the brake pipe pressure. By thus avoiding the necessity for all the brake pipe air to flow to one outlet (the brake valve port) at the extreme end of the brake pipe, and furnishing, in addition, a local outlet on each car, the time to apply all the brakes throughout the train was materially reduced. This decreased the length and improved the smoothness of the emergency stop. In other respects, the quick action automatic triple valve was similar to the plain triple valve. From the time of this invention, train speeds and weights were gradually increased and the train stops accordingly began to lengthen once more. It was known that this increase could be offset for emergency application by raising the brake pipe pressure, because this, in turn, would cause an increase in brake cylinder emergency pressure. The greater retarding force thus developed would not have been objectionable at high speeds on account of the coefficient of friction between the shoe and the wheel being low, but as the velocity of the train decreased the accompanying increase in the coefficient of friction would have caused the wheels to slide. Mr. Westinghouse overcame this difficulty in 1894 by inventing the high-speed reducing valve (Fig. 4), which was connected direct to the

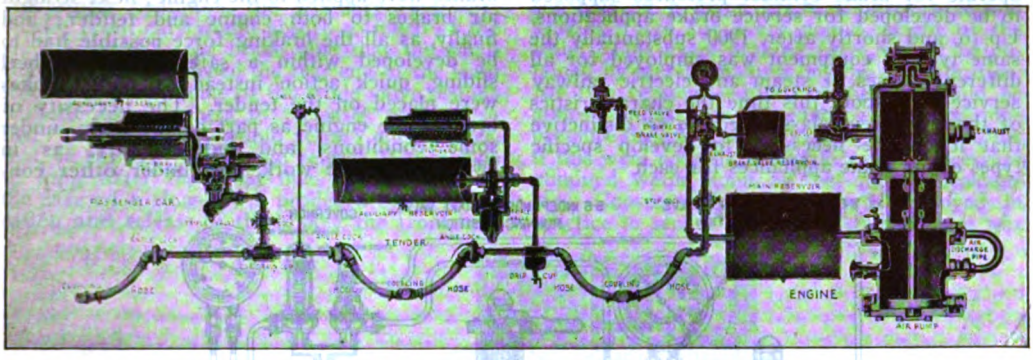


Fig. 3

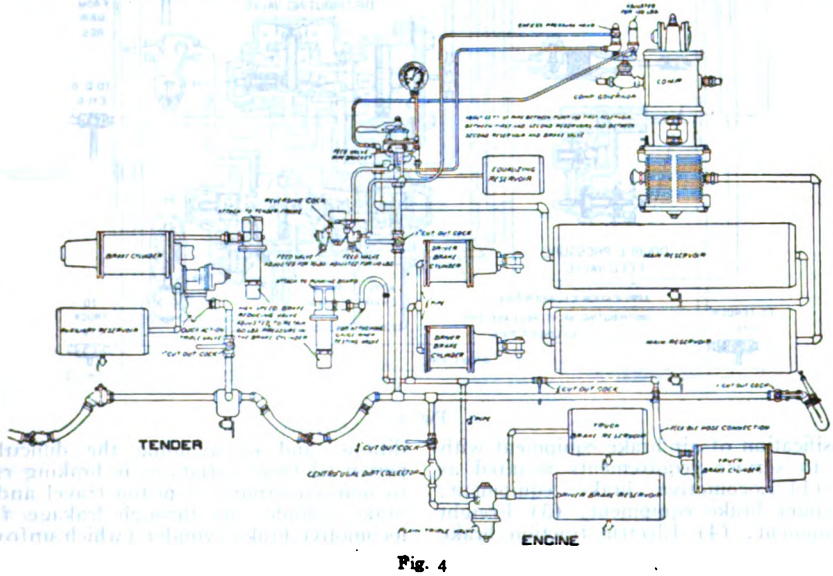


Fig. 4

brake cylinder. This valve permitted the use of high brake cylinder emergency pressure, which it gradually reduced throughout the stop to compensate for the increase in the coefficient of friction between the shoe and the wheel. The high-speed reducing valve did not operate for brake cylinder pressures supposed to be developed for service brake applications. Up to, and shortly after, 1900 substantially the same type of equipment was employed for all different classes of steam and electric railway service; but about this time the characteristics of these different classes became so distinctive that it became necessary to develop specific types of air brake appliances for each.

Locomotive Brake Equipment.— In the earlier days of railroading, no brakes were installed on the locomotive; then straight air brakes were applied to the engine; next straight air brakes to both engine and tender; and finally, as all the braking force possible had to be developed within a safe limit of wheel sliding, quick action instead of plain brakes were placed on the tender. The necessity of braking the engine as part of the train, under some conditions, and independently, as in switching, grade work, etc., under other conditions, and of avoiding the difficulties experienced from variations in braking ratio, due to non-uniformity of piston travel and loss of brake cylinder air through leakage from the locomotive brake cylinder (which unfortunately often had to be located near the hot boiler) resulted in the development of the No. 6-ET equipment (Fig. 5) during the period from 1903 to 1905, which overcame all these objections.

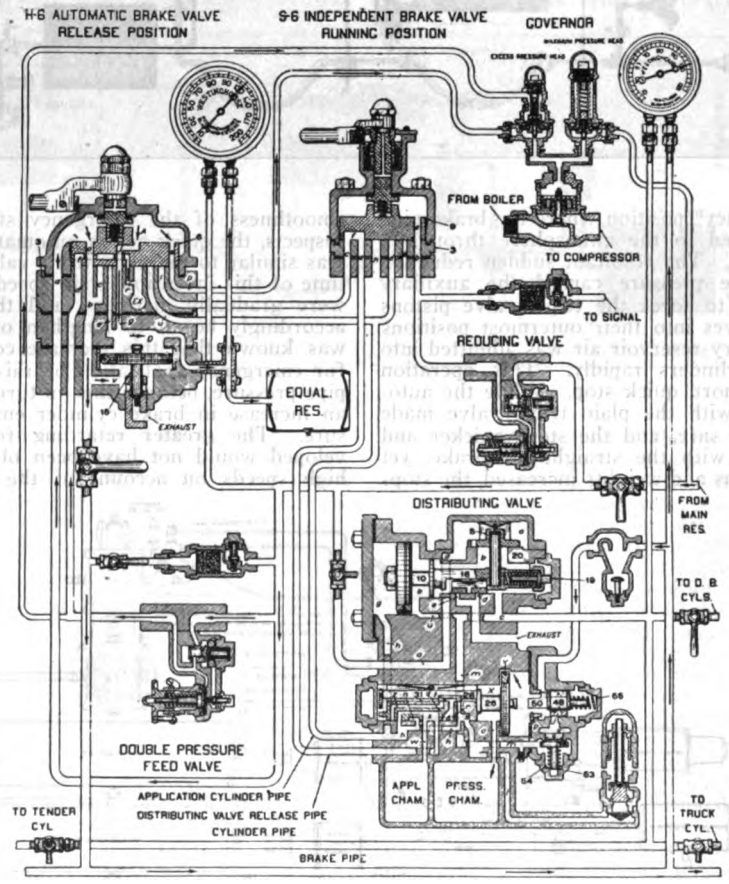


Fig. 5

A classification of air brake equipment with reference to service requirements resulted as follows: (1) Locomotive brake equipment; (2) Passenger brake equipment; (3) Freight brake equipment; (4) Electric traction brake equipment. In each of the above classifications quite a number of epoch-making inventions were brought out between the years 1900 and 1918 by Mr. Walter V. Turner, an eminent American engineer and inventor, which form the basis of rapid developments and improvements in the art, thereby not only advancing the status of the air brake, but contributing largely to the marked progress in railroad transportation during the years mentioned. These inventions are described in sequence of their development as follows:

Freight Brake Equipment.— When freight trains were composed of less than 50 cars, the automatic quick action type of triple valve invented in 1887 fully met the braking requirements. With the later practice of operating

60 and 80 cars per train, however, it was found that, during a service brake application, the brake pipe pressure reduced so slowly toward the rear of the train that the auxiliary reservoir air would leak past some of the triple valve pistons without actuating them and would thus cause a brake failure; that, during a release and recharging operation, the auxiliary reservoirs on the front cars would absorb so much of the air delivered to the brake pipe that the small quantity which reached the rear end of the train would leak past some of the triple valve pistons without forcing them to "release" position so that "stuck" brakes would result; and further, that, if the rear brakes did release, it would be so long after the front ones did so, that in the case of a slow-down, produced by an application and release of the brakes, the front cars would violently run out from the rear. During the period from 1903 to 1905, there was also developed the "K" triple valve, which eliminated the objections developed by the increasingly severe freight brake requirements. The "K" differed from the former type of quick action triple valve by quickly and positively transmitting a service brake pipe reduction by locally reducing the brake pipe pressure in its adjacent section of the brake pipe at a moderate service rate as soon as it assumed "service" position; by automatically restricting the communication between the brake pipe and auxiliary reservoir on the front cars during the release and recharging period and thereby enabling far more air to be transmitted toward the rear of the train than heretofore, so thus the releasing of the rear brakes and a uniform recharge of all the auxiliary reservoirs throughout the train were ensured; and by automatically restricting the release passage at the head end of the train in order to compensate for the time interval required to start the release of the rear brakes, so that all the brakes tended to release uniformly. To maintain the speed of a given train constant on a given grade requires a certain braking force for every pound weight of the train. This exact braking force cannot be obtained by merely making one brake application, for two reasons:— First, because it would be almost impossible to reduce the brake pipe pressure the exact amount required; and second, if this were possible, the brake cylinder pressure obtained would soon be lost due to leakage, etc. Consequently, the method employed in practice to secure the proper train control was to make a brake application to reduce the train speed; to release the brake cylinder air on each car through a restricted "retaining valve" port (until the retaining valve cut off the exhaust after the brake cylinder air had reduced to a predetermined pressure), while the brake system, in the meantime, was being recharged and the train speed increased; to make another brake application followed by a release; and to continue to repeat this cycle as long as the train was on the grade. Such operation necessitated that the train be sufficiently short to enable the brake system to be recharged in time to obtain another effective brake application before the train speed developed to an uncontrollable degree; and that the maximum speed reached through the braking cycle be sufficiently slow to ensure that the train could be

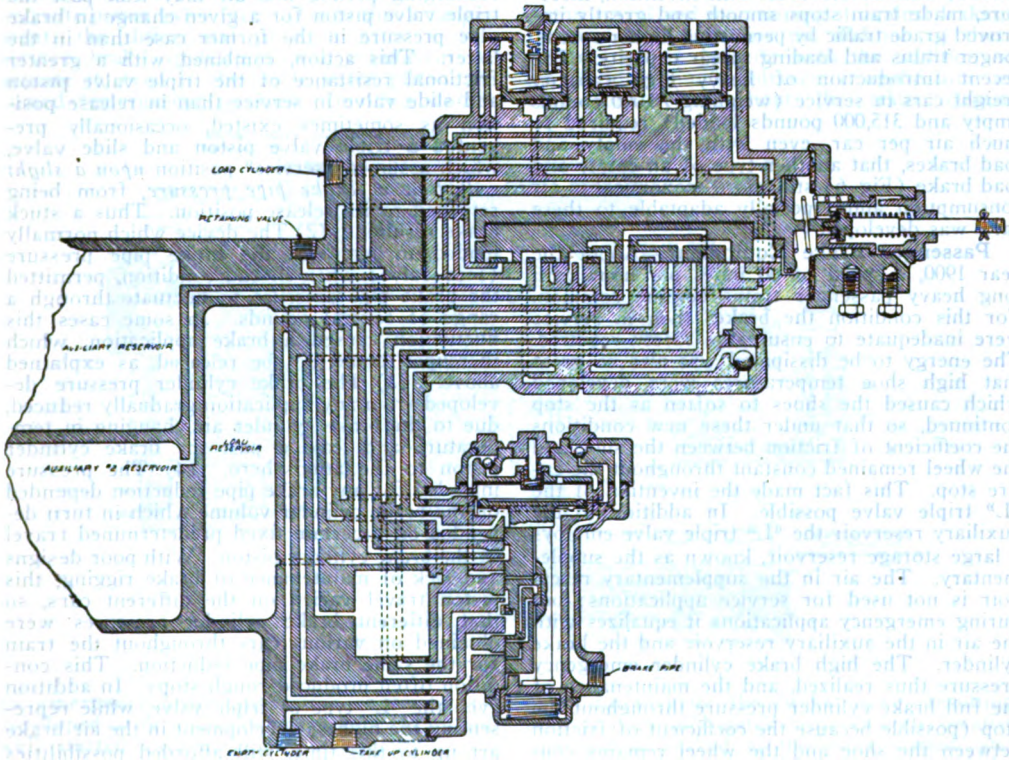


Fig. 6

stopped at any time. Furthermore, the braking force available on the loaded cars alone was inadequate to control the train speed on some grades of ordinary steepness, so that the practice of distributing empty cars throughout the train had to be resorted to, in order to secure the greater force per pound weight provided by the empty cars. As a result, trains on grades were short, only partially loaded and operated at slow speeds. Consequently, in various sections, grades restricted, and in fact limited, the traffic. To obviate this condition, the freight empty and load brake was devised, which provides substantially the same per cent retarding force for a loaded as an empty car and requires less air to produce a given braking force (the train considered, at least, partially loaded) than heretofore. This invention, therefore, made train stops smooth and greatly improved grade traffic by permitting higher speeds, longer trains and loading to car capacity. The recent introduction of heavy high capacity freight cars in service (weighing 70,000 pounds empty and 315,000 pounds loaded) required so much air per car, even with the empty and load brakes, that another type of an empty and load brake (Fig. 6) still more economical in air consumption and especially adaptable to these cars was developed.

Passenger Brake Equipment.—About the year 1900, a speed of 60 miles per hour with long heavy passenger trains became common. For this condition the brakes then in service were inadequate to ensure the safety required. The energy to be dissipated was also so great that high shoe temperatures were developed which caused the shoes to soften as the stop continued, so that under these new conditions the coefficient of friction between the shoe and the wheel remained constant throughout the entire stop. This fact made the invention of the «L» triple valve possible. In addition to the auxiliary reservoir the «L» triple valve employs a large storage reservoir, known as the supplementary. The air in the supplementary reservoir is not used for service applications; but during emergency applications it equalizes with the air in the auxiliary reservoir and the brake cylinder. The high brake cylinder emergency pressure thus realized, and the maintenance of the full brake cylinder pressure throughout the stop (possible because the coefficient of friction between the shoe and the wheel remains constant), greatly shortened the emergency stop and hence made it safe to run the train at high speeds. The «L» triple valve has four other important advantages, namely, quick recharge of the auxiliary reservoir after a service application, through the undisturbed air in the supplementary reservoir restoring the pressure in the auxiliary reservoir as fast as the pressure rises in its adjacent section of the brake pipe (up to the pressure at which the supplementary and auxiliary reservoirs equalize, which is very close to the maximum brake pipe pressure carried); uniform and quick release, after a service brake application, possible because the air initially delivered into the brake pipe after the brake application need only expand through the brake pipe on account of being relieved by the supplementary reservoir of the first stages of recharging the auxiliary reservoir; graduation of release secured by the supplementary reservoir charging the auxiliary reservoir to a slightly higher pressure than that in the brake pipe, when the recharging of the latter is cut off at the brake valve, so that the higher auxiliary reservoir pressure moves the triple valve pistons outward sufficient to cause the exhaust of brake cylinder air to be cut off; and a provision for each valve to reduce the pressure in its adjacent section of the brake pipe at a moderate service rate after the respective triple valve piston and slide valve have assumed service position.

With triple valves, including the «L» type, up to this time, however, the following conditions prevailed: (1) Since the brake pipe pressure reduces during a service brake application at a faster rate than it is restored during a recharging period, less air may leak past the triple valve piston for a given change in brake pipe pressure in the former case than in the latter. This action, combined with a greater frictional resistance of the triple valve piston and slide valve in service than in release position as sometimes existed, occasionally prevented a triple valve piston and slide valve, which assumed «service» position *upon a slight reduction in brake pipe pressure*, from being returned to its release position. Thus a stuck brake resulted. (2) The device which normally tended to maintain the brake pipe pressure (feed valve) when in bad condition, permitted the brake pipe pressure to fluctuate through a range of several pounds. In some cases this fluctuation caused a brake application, which thereupon could not be released, as explained above. (3) The brake cylinder pressure developed from any application gradually reduced, due to the brake cylinder air changing in temperature and leaking past the brake cylinder piston to the atmosphere. (4) The pressure intended for any brake pipe reduction depended on the brake cylinder volume which in turn depended on a certain fixed predetermined travel of the brake cylinder piston. With poor designs and lack of maintenance of brake rigging, this piston travel varied on the different cars, so that different brake cylinder pressures were obtained on various cars throughout the train for the same brake pipe reduction. This condition often produced rough stops. In addition even the «L» type of triple valve, while representing the highest development in the air brake art up to this time, still afforded possibilities of improvements in the following respects: (1) If the «L» triple valve were used on the same train with triple valves which did not have the graduated release feature (that is, triple valves which did not have supplementary reservoirs to recharge the auxiliary reservoirs to a slightly higher pressure than the brake pipe, when the latter was cut off at the brake valve, so that the higher auxiliary reservoir pressure could force the triple valve piston outward, thereby cutting off the brake cylinder exhaust) a rough stop would be produced when an attempt was made to apply the brakes fully at the beginning of a stop and then to «graduate off» the brake cylinder pressure. The stop would be rough because the triple valves, without the graduated release feature, would release their car brakes at once due to the immediate and entire exhaust of the brake cylinder air and thus permit their respective cars to lunge

forward, while the other triple valves would release their brakes by steps, and thus tend to hold their cars back. If the supplementary reservoirs were cut off to eliminate the graduated release feature, then their respective triple valves would lose their quick recharge feature and high emergency brake cylinder pressure secured through these reservoirs; (2) The «L» was the first triple valve to develop a higher brake cylinder pressure for emergency than for service brake applications. This higher pressure was secured from air in the supplementary reservoir being introduced into the auxiliary reservoir, and the brake cylinder through the operation of a piston valve actuated by the supplementary reservoir exposed one piston valve face forcing the piston valve in the direction of the brake cylinder pressure on the opposite piston valve face. Due to this arrangement, the differential pressure after a full service brake application was insufficient to actuate it, even if the triple valve piston assumed «emergency» position. In other words, an emergency brake application could not be developed after a service brake application had well started, even though the necessity for a quick, short stop arose after the service brake application had begun; (3) If the brake pipe pressure gradually depleted to a low degree it would be impossible to obtain an effective brake; (4) a shorter, quicker emergency stop was desirable. The above-enumerated desirable improvements were incorporated in the «PC» equipment with the No. 3-E control valve, which was brought out in 1909. This device automatically developed a greater slide valve resistance for an application than for a release of the brakes so that whenever a brake was applied it could surely be released; the auxiliary reservoir air equalized into a constant volume chamber, connected to a piston, instead of into a brake cylinder whereby this piston permitted the same pressure to be developed in the brake cylinder from main reservoir air irrespective of brake cylinder leakage or piston travel; graduated release was separated from the other valve functions; the emergency function was made independent of the service so that an emergency could be made after a service brake application; the depletion of brake pipe pressure to a predetermined low degree produced an emergency brake application; and a shorter, quicker emergency stop was secured by quicker transmission of the brake pipe reduction, quicker delivery of air to the brake cylinders and high brake cylinder pressure. To obtain what may be termed «ideal» train control in a practical way with methods that are fundamentally safe and sound, the «UCE» Universal valve with electrical appliances was perfected in 1912 (Fig. 7). This valve possesses substantially all the features of the «PC» equipment, previously mentioned, except the obtaining of brake cylinder pressure irrespective of piston travel and maintaining it against leakage (provision is made for the addition of these features, when desired) with the addition of the following: Simultaneous application of every brake throughout the train, electrically initiated by the brake valve, resulting in a smooth and quick stop, smooth because each car is braked at the same instant, and quick because the time of transmission of the brake application is eliminated; a more powerful brake than heretofore possible without the danger of rough stops on account of all cars being retarded simultaneously; ability to recharge the brake system while the brakes are held applied by closing the exhausts with a magnet valve; same degree of flexibility of brake control as possible with the straight air brake on even a single car realized by electrical appliances on each car; elimination of the possibility of the valve assuming emergency position when not intended by making the service and emergency valve mechanisms separate and distinct; simultaneous application of all brakes throughout the train in case of a break-in-two or rupture of the brake pipe obtained by a pneumatic switch on each car, which, when energized by electrical actuation, causes each valve throughout the train to assume emergency

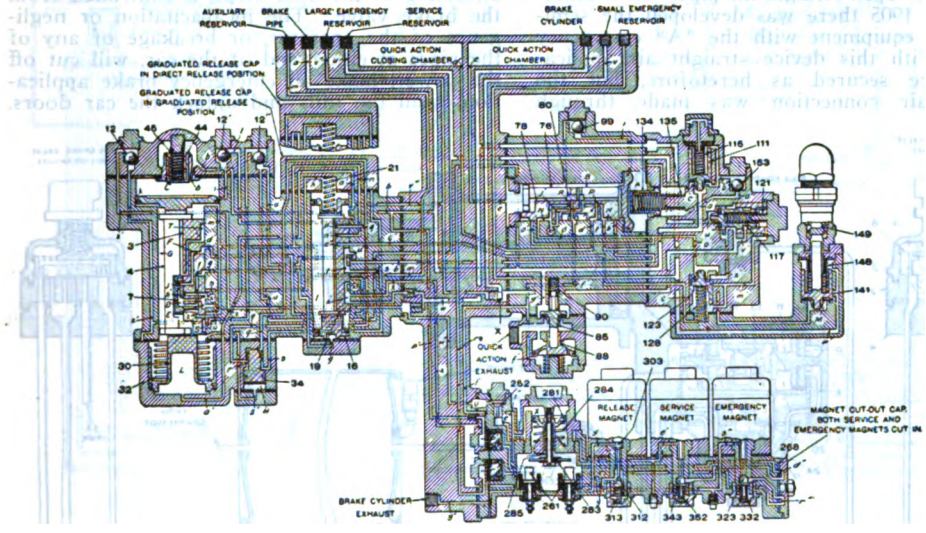


Fig. 7

position; and the ability to secure a relatively small rise of brake cylinder pressure per pound of brake pipe reduction when a reapplication is made before the brake cylinder air from previous applications has been entirely exhausted by automatically placing only a portion of the auxiliary reservoir under the control of the equalizing piston during this period; ability to cut out any features without interfering with others; ability of assembling valve so as to give the equivalent of any past standard valve; and ability to make one size of valve suitable for all sizes of equipment by using removable choke plugs to govern the flow of air instead of permanent restriction in the valve structure.

Electric Traction Equipment.— When all electric traction cars were operated singly, straight air brakes were used almost exclusively in this service. After two cars were employed as a unit, "straight air" became dangerous because, whenever the cars broke apart, no braking force could be maintained due to the brake cylinders being connected direct to atmosphere through the open straight air pipe. As a consequence in 1905 there was developed the semi-automatic equipment with the "A" emergency valve. With this device straight air applications were secured as heretofore, but the straight air connection was made through only the straight air pipe to be filled from the brake valve while the brake cylinders were charged by a reservoir located on its respective car, and controlled by a valve actuated through the medium of the air in the straight air pipe. This arrangement overcame to a considerable extent the serial time difference in the application of the various car brakes. It also developed the proper brake cylinder pressure irrespective of the brake cylinder piston travel and maintained this pressure against brake cylinder leakage. A late development of this particular type of equipment was of electro-pneumatic semi-automatic character, having as its main new feature the electrical control of straight air, with provision for a brake application in case any portion of the electrical equipment failed. A special phase of this type of equipment, recently developed, is the one-man car, or safety control equipment (Fig. 9). With this equipment the entire control of the car can be efficiently handled by one man. The opening and closing of the doors, as well as the folding and unfolding of the door steps, is controlled from the brake valve. The incapacitation or negligence of the operator, or breakage of any of the pipes at either end of the car, will cut off the power, make an emergency brake application, sand the rails and unlock the car doors.

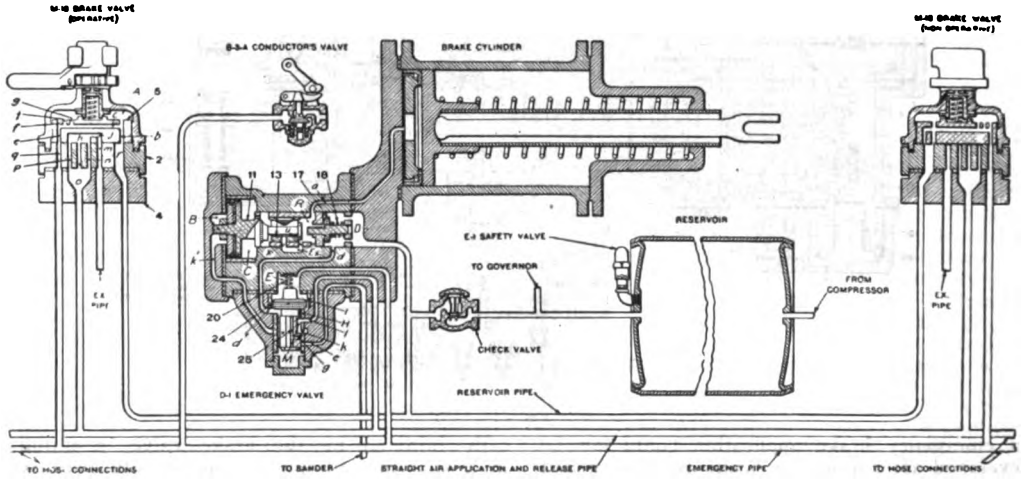


Fig. 8

the emergency slide valve. The emergency brake application was obtained by reducing the pressure in the "emergency" pipe, thus enabling the main reservoir pressure to force the emergency slide valve piston outward, which thereby cut off the straight air pipe from the atmosphere and thereupon connected the main reservoir direct to the brake cylinder. The accidental separation of cars produced a similar brake operation.

When more than two cars began to be operated as a unit, the serial time difference required to develop the braking force on the different cars was objectionable. The "D" type of emergency valve (Fig. 8) was therefore provided in 1906 to meet this new condition. This valve possessed substantially the same emergency feature as the "A" type of emergency valve; but for service application required

Another phase of the electric traction-road development consisted in the use of purely automatic devices as in steam-road service. Some roads which operated a number of cars as a unit at times ran the individual cars separately. To obtain flexibility of brake control realized with straight air in single cars and also to operate the head car of the train separately, when desired, a combined straight air and automatic system was developed in 1906. A recent development for electric traction service is the universal type of valve with an exhaust cut-off valve. This valve possesses all the features previously outlined for the universal valve for steam-road service and, in addition, permits the simultaneous delivery of air, for service applications direct from the reservoirs to their respective brake cylinders and simultaneous exhaust of brake cylinder air direct to the atmos-

phere without the actuation of the piston which ordinarily controls this service brake application and release. Any failure of electrical equipment produces a brake application. This latest device is a safe, highly flexible, instantaneously responsive brake. Another important development in the electric traction field is the variable load brake with the universal type of valve. With this equipment the weight of the passengers automatically adjusts the cylinder pressure obtainable for emergency, and per pound brake pipe reduction for service brake application so that the same emergency and service stopping distances are realized for a given speed irrespective of the load carried. Many other inventions used with these equipments have been developed. One of particular note is the type «J» electro-pneumatic governor for electrically-driven air compressors,— the first satisfactory electro-pneumatic governor ever developed for electric compressor control. Consult 'Development in Air Brakes for Railroads'; 'The Air Brake as Related to Progress in Locomotion'; 'The Vital Relation of Train Control to the Value of Steam and Electric Railway Properties'; 'The Development of the Electro-Pneumatic Brake'; 'Brake Performance on Modern Steam Railroad Passenger Trains'; also various other publications issued by the Westinghouse Air Brake Company, Pittsburgh, Pa.

WESTINGHOUSE AIR BRAKE COMPANY.

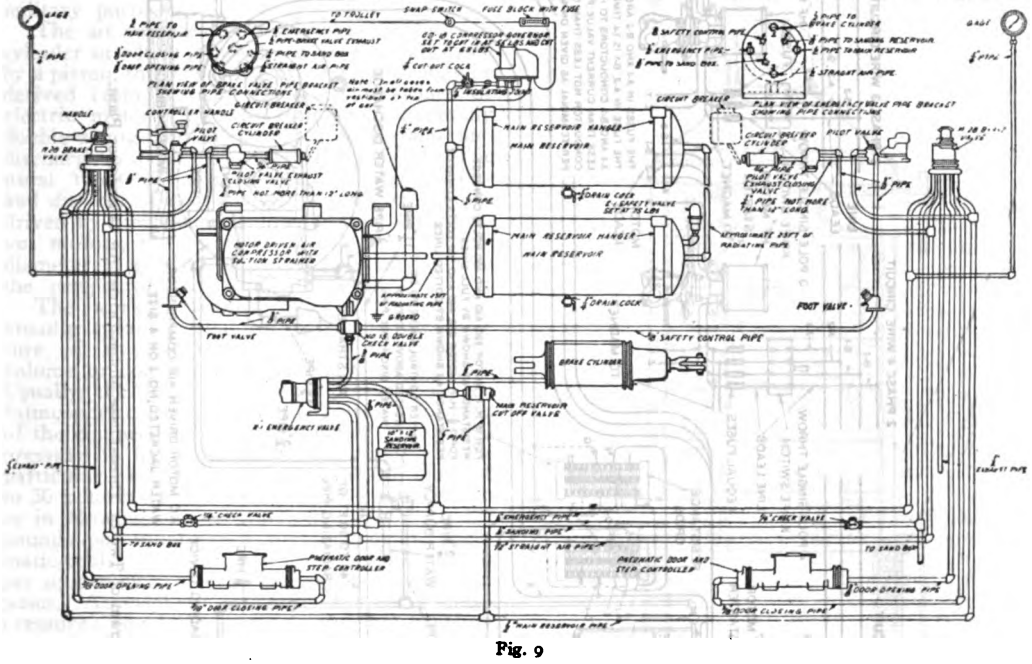


Fig. 9

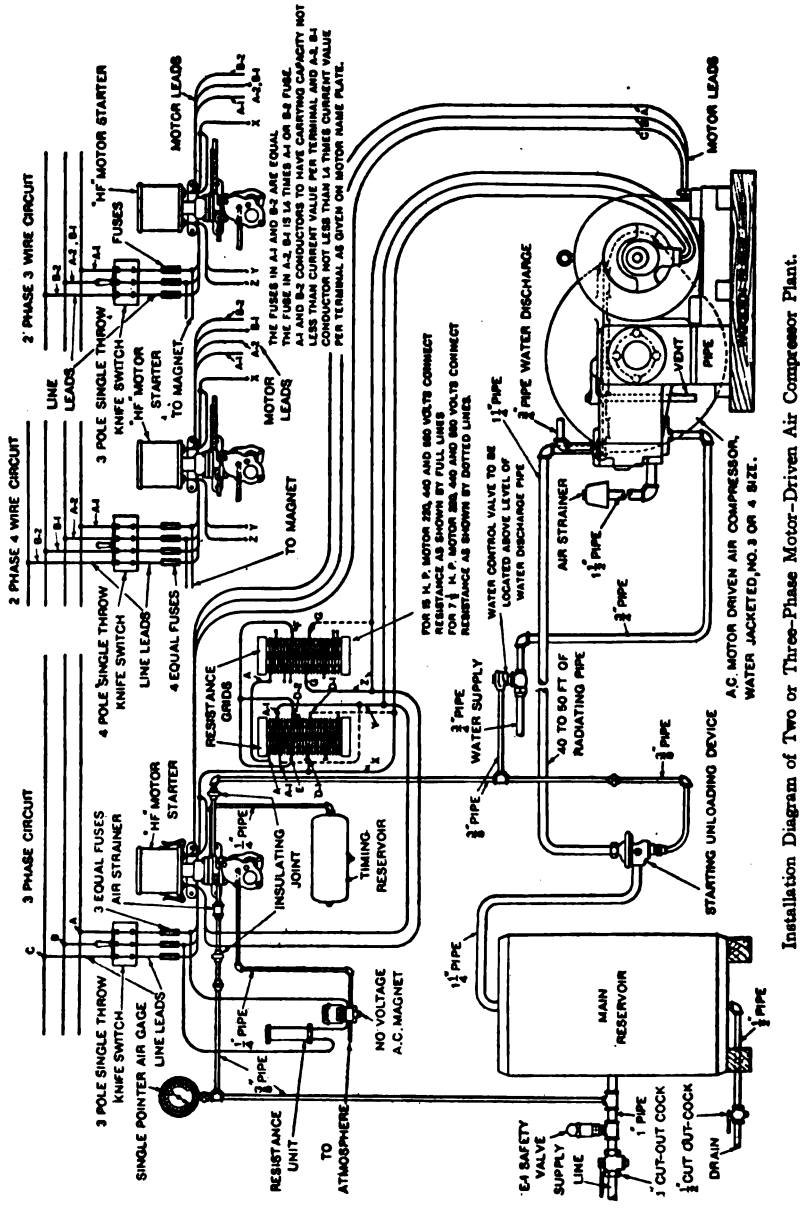
AIR-CELLS, cavities in the cellular tissue of the stems and leaves of plants which contain air only, the juices of the plants being contained in separate vessels. They are largest and most numerous in aquatic plants, as in the *Vallisneria spiralis* and the *Victoria regia*, the gigantic leaves of which latter are buoyed up on the surface of the water by their means. There are also air-cells in the bodies of birds. They are connected with the respiratory system, and are situated in the cavity of the thorax and abdomen, and sometimes extend into the bones. They are most fully developed in birds of powerful and rapid flight, such as the albatross.

AIR-CHAMBER, a reservoir in a hydraulic apparatus, in free communication with the water. The chamber or reservoir is filled with air, which by its elasticity diminishes the shocks that would otherwise be produced by sudden changes in the speed of flow of the water, and also equalizes the flow. When the pressure in the pipes is momentarily greater than the normal pressure, water enters the air-chamber and compresses the air it contains; and when the pressure is momentarily less than the normal, the reverse action takes place, and the elasticity of the air forces water back into the pipes.

AIR-COCK, a cock placed upon a water- or steam-pipe (notably upon a steam radiator) to allow of the escape of air from the piping.

AIR COMPRESSOR, a device used for compressing air, or, in other words, which makes the same weight of air occupy a less volume or a greater weight occupy the same volume. Any device which reduces the volume of air with a pressure increase is an air compressor. When released from the containing reservoir the air tends to resume its volume and this tendency is utilized by making the air perform mechanical work as it expands. Although compressed air has been used for working engines in confined situations, it is not at all likely that it will ever come into extensive use, owing to the great waste of power attending it. This waste arises from two causes: (1) The friction due to forcing the compressed air along a great length of pipe, and (2) the

loss from the dissipation of the great heat which results from its compression. The greater the original compression of the air the higher its temperature will rise; and as this caloric, which cannot be kept from escaping, is practically a part of the bulk of the air, it follows that the loss of power from this cause will increase with the pressure or tension of steam engines there is always a small quantity of water in the cylinders and slide-valves, arising from the condensation of a portion of the steam, and this suffices to lubricate the piston and valves. It is well known that when steam is *superheated* so highly as to prevent a slight condensation in the cylinder and slide-valves, they are very rapidly destroyed. Air rises in



Installation Diagram of Two or Three-Phase Motor-Driven Air Compressor Plant.

the air. Even were it possible to prevent the escape of the heat by covering the vessels and pipes with some non-conducting substance, it would not be practicable to use the hot air in the same way as steam is used, because the lubricating material necessary to keep the piston and slide-valves from "tearing" would be decomposed by the high temperature. In temperature when very much compressed, and we cannot use it until its temperature falls; and as this involves a great waste of power, it follows that where economy is of great consequence, air cannot be used as a mode of transmitting mechanical power. Indeed, no fluid can be economically used for transmitting power for any considerable distance.

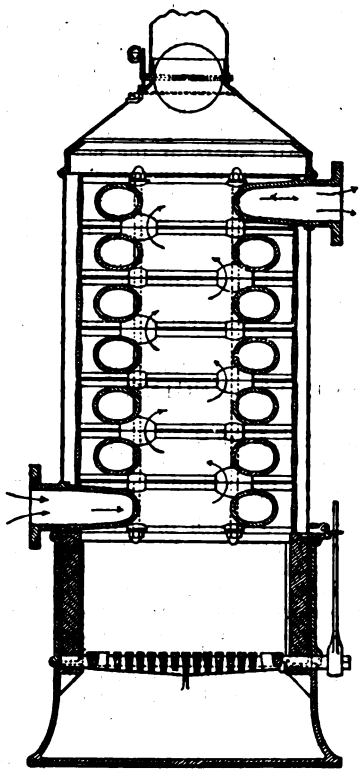
In its early history compressed air as a motive power for vehicles was not successful due to the fact that the storage tanks in use would admit of only small pressures. With its continued use and the development of storage tanks permitting the air to be compressed to an initial pressure of about 5,000 pounds per square inch it has made that class of motive power available for trucks used in manufacturing plants and for other vehicles designed to carry heavy weights for short distances. The extensive plants necessary for compressing the air and the fact that the storage tanks must be refilled frequently, as well as the inconvenience of transporting a large number of charged cylinders, make it impracticable as a motive power for vehicles used for commercial or military purposes.

The air compressor consists essentially of a cylinder in which atmospheric air is compressed by a piston, the power for driving which may be derived from a steam engine, water-wheel or electric motor. The air cylinder is generally double-acting and is provided with inlet and discharge valves in each cylinder head. The usual types of compressors are *straight-line* and *duplex*. Direct-connected compressors are driven by direct-current induction or synchronous motors, the rotors of which are of large diameter to produce a proper relation between the peripheral and rotative speeds.

The work performed by a compressor is, broadly speaking, that of increasing the pressure of air (or other gas) by reducing its volume or compressing it into a smaller space. Usually the lower or initial pressure is the "atmospheric pressure" at the point of location of the compressor, while the higher or terminal pressure is fixed by the requirements of the particular case, and may be anywhere from 10 to 30 pounds (gauge pressure) per square inch as in blowing engine practice, up to 80 to 125 pounds per square inch for rock drills, pneumatic tools, etc., and up to 1,500 to 2,000 pounds per square inch, or even higher, for special purposes. Atmospheric pressure (or zero gauge pressure) equals 14.7 pounds absolute pressure per square inch at sea-level (equivalent to 30 inches barometer) and becomes less as the altitude above sea-level increases, the decrease being approximately one-half pound, or one inch in mercury column, for each 1,000 feet increase in altitude. As the work of compression depends upon the initial and terminal absolute pressures (absolute pressure being equivalent to gauge pressure plus atmospheric pressure) the altitude at which the compressor is to work is of great importance and must always be taken into consideration.

When air is compressed into a smaller volume, if the temperature remains constant, the pressure increases directly in proportion to the decrease in volume; that is, if the volume is reduced one-half the pressure will be doubled; if reduced to one-third the pressure will be trebled, and so on for any decrease in volume. There is, however, another and most important factor in the problem which must be considered in all cases, particularly where high pressures are concerned, viz., the increase in temperature and consequent increase in volume due to the heat developed during compression. When air is compressed, part of the work done during compression is converted into heat, which must be taken up by the air compressed, the result being to very materially raise its temperature and increase its volume, thus adding largely to the work required to be done.

The single stage compressor consists primarily of an air-cylinder, in which the air drawn from the atmosphere is compressed, a steam cylinder, located above the air-cylinder, the two being connected by a suitable centre piece, steam and air pistons mounted on a common piston rod, and a valve motion controlling steam admission and exhaust. The compressor is double acting, steam being admitted alternately on either side of the steam piston which, being directly connected with the air piston, causes both to move up and down. On the upward stroke of the air piston the air above



Air Reheater.

it is compressed and discharged into the main reservoir, while the space below is filled with air drawn from the atmosphere. On the downward stroke this operation is reversed. The steam exhaust is piped to the smokestack or to the exhaust cavity of the saddle.

The great increase in compressor capacity called for in modern service has resulted in a much more careful consideration of the matter of steam consumption than formerly, and as a result the Westinghouse 8½-inch cross compound compressor was developed for the specific purpose of combining maximum capacity and highest efficiency, by compounding both the steam supplied and the air compressed to the extent that, while this compressor has a capacity over three times greater than the well-known

9½-inch single stage compressor, the steam consumption per 100 cubic feet of air compressed is but one-third.

While it is advantageous to keep the air as cool as possible during compression, heating it is an advantage, as soon as it leaves the receiver, for the reason that by this heating its volume or its pressure is increased. So important is this advantage, theoretically, that devices called reheaters are frequently employed to heat the air just before it passes to the motor or tool which it operates. Reheaters are made in many forms, the usual one being a kind of stove or oven through which the air passes by means of a spiral pipe or some other arrangement which allows it to be quickly heated.

The air reheater shown in the sectional drawing consists of a series of hollow annular rings bound together by four tie rods, the upper and lower rings having flanged openings projecting through the shell for pipe connections. These rings are surrounded by a sheet steel shell, the space between being filled with asbestos packing, which prevents loss of heat by radiation. Air enters at the bottom ring and leaves at the top, the openings connecting the rings being so arranged that the air is forced to travel through the heater in a circuitous passage. These heaters should be placed as near as possible to the work and the outlet pipe should be of large diameter, short and carefully covered, to prevent losses by radiation. See AIR-PUMP; COMPRESSED AIR; CONDENSER.

EDWARD S. FARROW,
Consulting Military and Civil Engineer.

AIRCRAFT ENGINE. See INTERNAL COMBUSTION ENGINE.

AIR-CYLINDER. A pneumatic buffer used to absorb the recoil of large guns. For 10-inch guns, one cylinder is used; for 15-inch guns, two. They are placed between the chassis-rails, to which they are firmly secured by diagonal braces. A piston traversing the cylinder is attached to the rear transom of the top carriage. When the gun recoils the piston-head is drawn backwards in the cylinder, and the recoil is absorbed by the compression of the air behind it. Small holes in the piston-head allow the air to slowly escape while the gun is brought to rest. The hydraulic buffer, largely used above, operates in the same manner, water being used instead of the air. See PNEUMATIC BUFFER.

AIRD, ārd, **Thomas,** Scottish poet who has won praise from high critics, but little popular acceptance: b. Roxburghshire 1802; d. 25 April 1876. He studied in the University of Edinburgh, and formed a lifelong intimacy with Carlyle; contributed to 'Blackwood's,' and won the warm good will of Wilson; edited the *Weekly Journal* 1832–35, and the *Dumfriesshire and Galloway Herald* (Dumfries) 1835–64. He published 'Religious Characteristics,' prose essays (1827); 'The Captive of Fez,' narrative poem (1830); a character story, 'The Old Bachelor in the Scottish Village' (1845), very popular at the time; etc.

AIRDRIE, Scotland, a municipal and parliamentary burgh in Lanarkshire, 11 miles east of Glasgow. It depends chiefly on the collieries and iron-works in its vicinity, but has also a large cotton-mill and factory, several extensive foundries and machine-shops, tube-works and a number of hand-loom weavers. Pop. about 25,000.

AIR-DRILL, a rock drill or other form of drill actuated by compressed air.

AIREDALE DOG. See TERRIER.

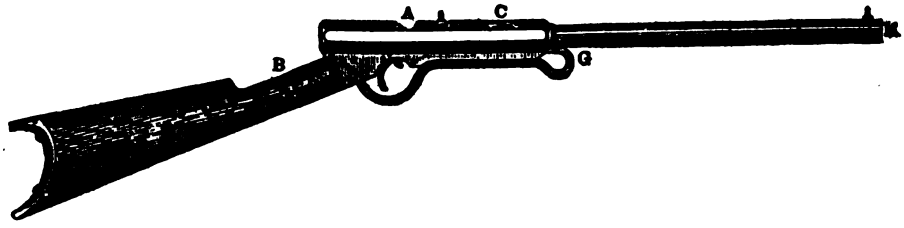
AIR-ENGINE, an engine in which air is the working body. Such an engine may be operated by air previously raised to a high pressure by a compressor, as in the storage and transmission of power by compressed air; or it may derive its power directly from the burning of fuel. In the latter case it is often called a hot-air engine. For the elementary theory of the hot-air engine, see THERMODYNAMICS.

AIRE-SUR-LA-LYS, ār-sür-lä-lē, a town of France, department of Pas-de-Calais, 10 miles southeast of Saint Omer. It stands at the junction of the Lys with the Laquette, on a low marshy site, but is well built, and possesses several beautiful fountains, a handsome Gothic church and barracks for 6,000 men. Its trade is chiefly in linens, fustians, hats, thread, starch, soap, Dutch tiles, osier work and grain.

AIR-GAS, an inflammable gas produced by charging air with the vapors of naphtha, gasoline or some similar volatile hydrocarbon.

AIR-GATE, in foundry work, an opening left in the mold for the escape of air and other gases as the molten metal enters.

AIR-GUN. An instrument resembling a musket, used to discharge bullets or darts by the force of compressed air instead of gunpowder. Various forms of construction have been adopted. The most usual plan is to insert a condensing syringe in the stock of the gun.



AIR GUN.

The piston of this syringe is worked by an apparatus which passes through to the exterior of the gun, and this working causes a small body of air to be condensed into a chamber. The chamber has a valve opening into the barrel just behind the place where the bullet is lodged. The gun is loaded from the muzzle, as ordinary muskets or fowling-pieces. The trigger opens the valve; the highly compressed air rushes

forth and propels the bullet. By a certain management of the trigger, two or three bullets, successively and separately introduced, can be fired off — if firing it can be called — by one mass of condensed air. Another form of air-gun contains several bullets in a receptacle or channel under the barrel; by the movement of a cock or lever one of these bullets can readily be shifted into the barrel; and thus several successive discharges can be made after one loading — on a principle somewhat analogous to that of the revolving pistol. Some varieties of air-gun have the condensing syringe detached, by which means a more powerful condensation of air may be produced. This done, the air-chamber is replaced in its proper position behind the bullet in the barrel. Those air-guns which present the external appearance of stout walking-sticks, and are hence called air-canes, have a chamber within the handle for containing condensed air, which can be unscrewed and subjected to the action of the condensing syringe. One inventor has devised a form of air-gun with two barrels — one of small bore for the reception of the bullets, and another of larger bore for the reservoir of condensed air; the condensing syringe being within the stock of the gun. An attempt has more recently been made to combine the action of elastic springs with that of compressed air in an air-gun; springs of gutta-percha, or of vulcanized india-rubber, are employed in substitution of or in co-operation with a condensing syringe. No form of air-gun hitherto made has had power enough to propel a bullet to any considerable distance, and therefore the instrument is scarcely available in war. The air-gun was known in France over two centuries ago; but the ancients had some kind of apparatus, by which air was made to act upon the shorter arm of a lever, while the larger arm impelled a bullet.

AIR-HOLE, or **BLOW-HOLE,** a fault in a casing, due to the presence of a bubble of air or other gas.

AIR-LOCK, an air-tight chamber used in tunneling, when the tunnel has to be kept filled with compressed air to prevent the entrance of water. The air-lock communicates with the tunnel by one door, and with the outside air by another. It serves the double purpose of permitting the workmen to enter and leave the tunnel without undue loss of air, and of partially mitigating the physiological effects of a too sudden transition from the high pressure in the tunnel to lower pressure outside.

AIRPLANE ENGINE. See INTERNAL COMBUSTION ENGINE.

AIR-PLANT, more properly *epiphyte,* a plant growing upon the trunk or top of another plant (the host), but not anatomically connected with it. Air-plants derive their nutriment chiefly from the air and rain, commonly by means of aerial roots. Parasitic plants, on the other hand, are directly connected with the plant upon which they grow and extract their food from the host. Air-plants are most common in moist tropical forests, often completely covering the trunks and branches of trees. They belong chiefly to the ferns, mosses, bromeliads, orchids and aroids, and are mostly herbaceous, but sometimes shrubs are epiphytic upon tropical trees. In the United States air-plants are found chiefly in Florida, but one, Spanish moss (*Dendropogon usneoides*), is common throughout the Southeastern States.

AIR-PUMP. A machine by means of which air or other gas, water or other liquids may be removed from an enclosed space. The essential part is a hollow cylinder, in which an air-tight piston is made to move up and down by a rod. From the bottom of the cylinder a connecting tube leads to the space which is to be exhausted, which is usually formed by placing a bell-glass, called the receiver, with edges ground smooth and smeared with lard, on a flat, smooth plate or table. When the piston is at the bottom of the barrel, and is then drawn up, it lifts out the air from the barrel, and a portion of the air under the receiver, by its own expansive force, passes through the connecting tube and occupies the space below the piston, which would otherwise be a vacuum. The air in the receiver and barrel is thus *rarefied.* The piston is now forced down, and the effect of this is to close a valve placed at the mouth of the connecting tube and opening inward into the barrel. The air in the barrel is thus cut off from returning into the receiver, and, as it becomes condensed, forces up a valve in the piston, which opens outward, and thus escapes into the atmosphere. When the piston reaches the bottom and begins to ascend again, this valve closes; and the same process is repeated as at the first ascent. Each stroke thus diminishes the quantity of air in the receiver; but from the nature of the process it is evident that the exhaustion can never be complete. Even theoretically there must always be a portion left, though that portion may be rendered less than any assignable quantity; and practically the process is limited by the elastic force of the remaining air being no longer sufficient to open the valves. The degree of rarefaction is indicated by a *gauge* on the principle of the barometer. By means of the partial vacuum formed by the air-pump a great many interesting experiments can be performed, illustrating the effects of atmospheric pressure and other mechanical properties of gases. The air-pump was invented by Otto Guericke, in 1654; and though many improvements and varieties of structure have been since devised, the principle of all is the same. Two barrels are generally used, so as to double the effect of one stroke. In some air-pumps, stop-cocks turned by the hand take the place of valves, and in others the entrance of the connecting tube into the cylinder is so contrived that the valve through the piston is not required. The air-pump used in connection with the densimeter is of the ordinary construction.

The use of compressed air for pumping water, oil or other liquids from wells, vats and tanks, is now general. The simplicity and ease of maintenance attending its use make it far superior to any other means of conveying liquids. In deep wells particularly, great economy is found in the use of air as compared with the old time deep-well pump. No valves, no reciprocating rods and plungers, and no wasteful steam cylinder at the top to operate them are required. The air may be compressed at any convenient point, such as an existing power house, and yet do pumping at an isolated or distant place; several separate wells, if necessary, being pumped from one central station.

Westinghouse compressors have been found

well adapted to this class of work and are largely employed for furnishing the compressed air to raise or convey liquids in breweries, tanneries, oil wells, dairies, hospitals, chemical laboratories, acid plants and especially all kinds of water wells.

The Latta-Martin displacement pump is an efficient and reliable device designed to pump water by air pressure. Extremely simple in construction, it requires no packing nor lubrication, has no dead centre, no pistons, no plungers, will not freeze in the severest weather, and is entirely automatic. It will pump from any distance, to any elevation, in any quantity, handling muddy or gritty water without injury. In the general design of the apparatus, the two cylindrical chambers are connected at the top by an automatic air-valve mechanism and at the bottom by suitable piping and check valves. The air pressure entering at the top is delivered alternately to the respective chambers, discharging the water contained therein through the check valves and discharge pipe. As a chamber is emptied of water, the remaining air is exhausted through a port in the upper valve gear, while water simultaneously replaces it through the check valves below. This simple operation is repeated alternately upon each side of the pump and is entirely automatic. The pump may be placed at any point of water supply — in a dug well or in a river — and can be operated and controlled by the engineer even though situated several miles from the source of power. A modified form of these displacement pumps can be used in driven wells having casings six inches or more in diameter. This form is particularly valuable for cases where the water level in the well falls a considerable amount, either during the pumping operation, or at different times of the year, as the action of the pump is not affected by the position of the water level. See AIR-COMPRESSOR; CONDENSER; COMPRESSED AIR; POWER; POWER, TRANSMISSION OF.

AIRSHIP. See AERONAUTICS, HISTORY OF; AIRPLANE; DIRIGIBLE; MILITARY AERONAUTICS.

AIR-THERMOMETER, a thermometer in which temperature is measured by determining the change of volume of a mass of air that is kept at constant pressure, or the change of pressure of a mass that is kept at constant volume. See THERMOMETRY.

AIR-TRAP, in steam and hydraulic engineering, a place where air can accumulate in a line of piping; as at the highest point of a line of water pipe. Air-cocks are placed at these points to permit of the removal of the accumulated air. Also called *air-bond.*

AIRY, ār'i, SIR **George Biddell,** English astronomer-royal: b. Alnwick, 27 July 1801; d. 2 Jan. 1892, in Greenwich. He was graduated at Trinity College in 1823. In 1826 he was appointed Lucasian professor of mathematics at Cambridge, a chair once held by Newton, and he was the first actual director of the Cambridge Observatory, holding in connection with this post the Plumian professorship of astronomy. In 1835 he succeeded Pond as director of the Greenwich Observatory, and retained this office till 1881, when he retired on a pension. He initiated at Greenwich the plan of immediately and completely reducing observations; introduced the regular observation of magnetic phenomena, and of sun-spots by photography; invented new instruments for lunar observations; and arranged the British observations in all parts of the world of the transit of Venus in 1874. His chief works are 'Mathematical Tracts' (1826); 'Ipswich Lectures on Astronomy' (1849); 'Undulatory Theory of Optics' (1866); 'Treatise of Sound' (1869); and 'Treatise on Magnetism' (1870).

AISLE, īl', in architecture, one of the lateral and usually lower divisions of a building which is divided lengthwise, as by rows of columns or piers, so that the roof is supported while still the interior is one large hall broken only by the uprights. The basilicas of the Romans were built in that way, as had been the small interiors of many Grecian temples; and when the first Christian churches were built in Italy and in the East, this "basilican" form rivaled the round or polygonal plan and the plan of the Greek cross in popularity. At a later time Christian churches were nearly always built with aisles and a higher central part called usually the nave. Most churches have an aisle on either side of the nave, and are called "three-aisled" churches, but there are a few with five, and the famous Cathedral of Antwerp in Belgium has seven aisles, being almost alone in this respect. It is a mistake to count an outer row of chapels as another aisle.

By extension the term covers such a long and narrow compartment of a building as is found in one of the great mosques of Cairo, Cordova and Damascus. These buildings have generally flat roofs intended always to be of masonry, and that structure is carried by a great number of parallel rows of columns. The resulting "aisles" are, of course, of the same height. In the mosque of Cordova there are 17 such aisles left open, besides two outer ones which are largely enclosed for chapels; all the aisles opening by doors or windows upon a large court.

AISNE, ān', France, a northeastern frontier department which takes its name from the river Aisne, a tributary of the Oise. Area, 2,866 square miles; pop. 530,300. The surface is level; the soil fertile; drained and watered by the rivers Ourcq, Marne, Oise and Aisne, names celebrated in the great European War for the battles that raged on their banks. Together with several canals, these rivers carry a considerable traffic. Owing to numerous small lakes and stretches of forest the climate is cold and humid, though well adapted to agriculture and pasturage. The principal crops are cereals, but hemp, flax, potatoes and oil-seeds are also largely cultivated. Cotton and other textiles are manufactured at Saint Quentin, and at Saint Gobain the plate-glass works have been in operation since 1665. Laon, Soissons, Saint Quentin, Chateau-Thierry and Vervins are the chief arrondissement towns, with Laon as capital of the department. See WAR, EUROPEAN.

AISNE, ān, a river in northern France, with a total length of 280 miles. A tributary of the Oise, the Aisne rises in the Argonne Forest, flows north and then west, joining the Oise above Compiègne (on the left bank) after passing Vouziers, Rethel and Soissons, taking in on the way its affluents the Aire and Vesle, on the latter of which stands Rheims.

It flows through the departments of Marne, Ardennes, Aisne and Oise. From Mouron for about 170 miles the river is used for floating lumber; from Château-Porcien it is navigable for 75 miles, and from Neufchâtel, about 15 miles below that point, there is considerable traffic. A lateral canal runs from Vouziers to Condé — above Soissons. The Canal des Ardennes (62 miles long) begins at Condé, below which the Aisne is canalized and connected with the Meuse. The lateral canal of the Aisne is connected with that of the Marne at Condé-sur-Marne by a 36-mile canal. On its north side the Aisne has a line of steep ridges, the scarp of a great plateau, at an average of a mile or more from the stream. The height of the scarp varies from some 200 feet, where the uplands begin on the west above Compiègne from the Forest of the Eagle, to more than 450 feet 30 miles east in the high bluffs of Craonne. Beyond this latter place the Aisne takes a wide sweep to the northeast toward its source, and the banks fall to the lower level characteristic of the shallow dales of Champagne. From Compiègne to Craonne the section is everywhere of the same type, with occasional deeper ravines. For the most part the lower slopes are steep and clothed with grass. The plateau stretches back for some miles, till at La Fère and Laon it breaks down into the plains of northeastern France. It was the crest of this plateau that the German armies had chosen — at an average of two miles from the river bank — on which to make a stand after they had been hurled back on the Marne (q.v.) in September 1914. The position was well chosen, for it was one of enormous strength, extending from a point on the heights of the Meuse north of Verdun westward across the Argonne and the plain of Champagne to Rheims, where it turned northwest along the Forts de la Pompelle, Nogent l'Abesse, Berru and Brimont, and across the Aisne near its confluence with the Suippe to Craonne, whence it ran westward along the heights of the Aisne to the Forest of the Eagle, north of Compiègne. During their advance to the Marne the Germans had left parties of sappers behind to entrench the Aisne position — in case of necessity. How that necessity actually arose from the historic battle of the Marne is told elsewhere (See WAR, EUROPEAN). That battle began 6 Sept. 1914; on 8 September General von Kluck's army was in full retreat and on the 9th von Buelow's army followed. On the 10th the battle was over and the British and French became the pursuers. On the 12th the Germans were in position on the Aisne, and on the 13th the Allies began the passage of the river. The first phase of the battle of the Aisne closed on 18 Sept. 1914, and from that day began the remarkable trench warfare that became so prominent a feature of the great war.

AISSÉ', ā'ē-sā, or **HAIDEE, Mademoiselle**, French-Circassian author: b. Circassia 1694; d. Paris 1733. The daughter of a Circassian chief, captured at four years of age in a Turkish raid, she was bought in the slave market at Constantinople by Count de Ferriol, French ambassador. He sent her to Paris to be educated, where, later, introduced by the Count's sister-in-law to the Regent's receptions, she was greatly admired for her beauty and her wit. Count de Ferriol took advantage of her innocence, but she repulsed the French Regent's advances, and made a love match distinguished by great affection and fidelity, with Chevalier d'Aydie, a Knight of Malta, by whom she had a daughter. Her latter years were marked by sincere devotion and piety. Her 'Letters,' published with annotations by Voltaire (1787), contain interesting pictures of court life of the period and anecdotes of contemporary personages, notably Madame du Deffand and Madame de Tencin. They also reveal the great charm of the author's personality. She is the original of the Haidee in Dumas' 'Count of Monte Cristo,' and has been the subject of at least three plays. The best editions of her 'Letters' are those of M. Ravenel, with introduction by Sainte-Beuve (1846), and by Eugene Asse (1873). Consult Courteault, 'Une idylle au XVIIIe siècle; Mademoiselle Aïsse et le Chevalier d'Aydie' (Maçon 1900); and Gosse, E., 'French Profiles' (London 1905).

AITKEN, āt'kĕn, **Robert Grant**, American astronomer: b. Jackson, Cal., 31 Dec. 1864. In 1887 he was graduated at Williams College, then became instructor of mathematics at Livermore College, in California. In 1891 he was appointed professor of mathematics and astronomy at the University of the Pacific and four years later he became astronomer at the Lick Observatory. In 1898 he was a member of the expedition sent by the Lick Observatory to the Flint Islands to observe an eclipse. He has discovered over 2,400 double stars, for which the Academy of Sciences of France awarded him the Lalande prize in 1906. From 1897 to 1908 he edited the publications of the Astronomical Society of the Pacific, besides which he has contributed many articles to German and American journals on astronomical subjects.

AITKIN, Robert, American printer and publisher: b. Dalkeith, Scotland, 1734; d. Philadelphia, July 1802. Emigrated to America, 1769; settled in Philadelphia as a bookseller, becoming later a bookbinder and publisher as well. He published the *Pennsylvania Magazine* (1775–76), and printed numerous documents and state papers for the Continental Congress, among them the 'Journals of Congress' from 5 Sept. 1774 to 1 Jan. 1776 (Phila. 1777–80). At his own expense he published in 1782 the first English Bible printed in America. This is now the rarest of all early Bibles printed in America, not more than 25 copies being known to exist. In 1777 Aitkin was imprisoned for his attachment to the cause of independence. His daughter, Jane Aitkin, was one of the first business women of America. After her father's death in 1802, she carried on his business as printer and publisher. Among other books she published in 1808, in four volumes, the translation of the Septuagint made by Charles Thompson, secretary of Congress.

AITON, ā'tŏn', **William**, Scotch botanist: b. Hamilton, Scotland, 1731; d. Kew Palace 1793. In 1759 he was appointed director of the botanical garden at Kew, and in 1789 published the work by which he is remembered, 'Hortus Kewensis' (3 vols.), in which, under the Linnean system of arrangement, 5,600 species are described, indicating their origin, mode of culture and date of introduction in

England. His assistants in this monumental work were Dr. Solander and Mr. Jonas Dryander, two cultured Swedes.

AITZEMA, āt-zēm'ä, **Lieuwe (Leo) Van,** Dutch official and historian: b. 1600; d. 1669. An expert in politics and political science, he was resident-agent of the Hanseatic League at The Hague for 30 years, and author of the most valuable work on the eventful epoch of Dutch history covering the years 1621 to 1668, entitled 'Zaaken van Staat en Oorlog in Ende omtrent de Vereenigde Nederlanden' (14 vols., 1657–71; 7 vols., 1685–99, continuing the history to 1697).

AIVALI, ai-vä'li, or **KIDONIA,** ki-dō-ni'a (the ancient *Heracleia*), a town of Asiatic Turkey, on the western promontory of the Gulf of Adramyti, 66 miles northwest of Smyrna. In the beginning of the present century it was a place of considerable note, but in June 1821, during a contest between the Greeks and Turks, it was set on fire by the latter and reduced to ashes. It has again revived, however, and possesses a population of about 35,000. The olive is extensively cultivated in the district, and much oil and soap manufactured.

AIVAZOVSKII, Ivan Konstantinovitch, Russian painter: b. Feodociya 1817; d. 1900. From his earliest years he showed a remarkable talent for painting. Koch, the architect of his native town, discovered his gift and also gave him a few private lessons in perspective and architectural designing. Thanks to the influence of Koch and some other friends Aivazovskii succeeded in entering (1833) the Academy of Fine Arts where he learned the art of aquarelles from Philippe Tonneur. His first work, which attracted general attention, was the 'Study of Air above the Sea' (1835) for which he was awarded a silver medal. Henceforth Aivazovskii pursued exclusively this field of painting and, in order to acquire adequate impressions of light on the nature of the sea, he sailed extensively over the Gulf of Finland and the Black Sea. His extraordinary memory helped him to retain and reproduce with great vigor and fullness the most singular moments at sea, hence there is a complete absence of monotony or repetition in his works. He traveled extensively through Italy, France, Germany and England where his fame as a sea painter was already well established by his remarkable paintings made in Rome: 'Neapolitan Night,' 'Storm' and 'Chais.' The 'Boat of the Tcherkessian Pirates,' 'Stillness on the Mediterranean' and 'Island of Capri' won prizes at the Exposition of Paris (1843) and gained him the title of academician. In 1857 at the Exposition of Paris, he was awarded the order of the *Légion d'Honneur* for his remarkable 'The Four Wealths of Russia.' Of his later paintings the best known are: 'Universal Deluge'; 'The Moment of the Creation of the World' (1864); 'The Chain of Caucasian Forests' (1871). At the Exposition in Florence the Academy of Fine Arts there asked him to paint his own portrait for the gallery in the Palazzo Pitti where are kept portraits of the most celebrated painters of the Renaissance. At the time of the Russo-Turkish war 1877 Aivazovskii painted a new series of episodes and in 1880 there was held an exposition of his works illustrating different episodes from the life of Columbus. On 20 Sept. 1887 Aivazovskii celebrated his 50th jubilee on which occasion he presented the Saint Petersburg Academy of Fine Arts with 'Pushkin on the Sea-Shore' painted in co-operation with L. E. Ryspyny.

AIX, āks, France, town and capital of an arrondissement, department of Bouches-du-Rhône, 17 miles by rail north of Marseilles. Its interest is chiefly historical. It was the 'Aquæ Sextiæ' — Baths of Sextius — founded 123 B.C. by the Roman consul Sextius Calvinus around the thermal sulphurous springs. In the Middle Ages it was the capital of Provence and became a great seat of learning, renowned for its faculties of law and theology. Both baths and university under modern development continue their usefulness; and fine historical and modern buildings attract the attention, notably the cathedral dating from the 11th century, and the archiepiscopal palace. Pop. 20,000; including suburbs, 30,000.

AIX-LA-CHAPELLE, āss, or āx-lä-shäpĕl' (German, *Aachen;* Latin, *Civitas Aquensis, Aquisgranum*), capital of a district of the same name in the Prussian province of the Rhine, 38 miles west by south of Cologne; pop. 156,150. It is a well-built town, pleasantly situated in a fine vale watered by the Wurm, and surrounded by the Venn Hills. It was formerly surrounded by ramparts, but these have been converted into pleasant promenades. The town-house (built in 1353 on the ruins of Charlemagne's palace) contains the coronation room with portraits of the German emperors, half-size portraits of Napoleon and the Empress Josephine, painted by David, and many relics of old German art. The nave of the cathedral, erected by Charlemagne as a palace chapel between 796 and 804, was rebuilt on the old model by Otho III in 983, after having been almost destroyed by the Normans. It consists of an octagon, surrounded by a 16-sided gallery, and terminating in a cupola. The Gothic choir was begun in 1353 and finished in 1413; it is of prodigious height (114 feet) and lightness, and the large windows are filled with stained glass. Besides the tomb of Charlemagne, the cathedral contains many relics, the most sacred of which — such as the robes worn by the Virgin at the Nativity, the swaddling-cloths of the infant Jesus, the scarf He wore at the crucifixion, etc. — are shown only once in seven years, and attract many thousands of pilgrims from all countries. As the chief station of the Belgo-Rhenish Railway, which connects it with Antwerp, Ostend and Cologne, Aix-la-Chapelle affords an extensive mart to the commerce of Prussia; it is also a grain market for Belgium, and the seat of commercial and other courts. Electric street railroads connect with handsome suburbs and neighboring towns. Aix-la-Chapelle was eminent as a manufacturing city, especially of cloth and needles, as early as the 12th century; and its prosperity in this respect still continues. Its woolen cloths are highly esteemed on the continent of Europe and are also exported to America, China, etc. All trading countries, including the United States, have consulates in the city. It is estimated that over 30 per cent of the inhabitants are employed in the manufactures of the city. Although Aix-la-Chapelle is an extensive seat of

manufactures and has considerable commercial relations, it derives its celebrity chiefly from its historical associations, and a considerable portion of its importance and prosperity from the influx of visitors to its baths. There are in all eight mineral springs here, six of them warm. The most famous is the Imperial Spring or *Kaiserquelle,* which has a temperature of 143° F., and the vapor of which, when confined, deposits sulphur. For the accommodation of strangers there are a number of bathing-houses. The rooms for bathing are excellently fitted up, with baths from 4 to 5 feet deep, built in massive stone and in the old Roman style. About a half mile north of the city is the Louisberg or Lousberg, rising nearly 300 feet higher than the city. It is a favorite summer evening resort of the citizens.

Aix-la-Chapelle was known to the Romans as early as the time of Cæsar, and is mentioned by Pliny under the name of Vetera. It was, after 768, the favorite residence of Charlemagne, who made it the capital of all his dominions north of the Alps and spared no expense in beautifying it. Here he died in 814, and in the cathedral his tomb is marked by a large flat slab with the inscription *Carolo Magno.* During the Middle Ages it was a free imperial city, and its citizens throughout the empire were exempt from feudal service, from attachment of their goods and persons and from all tolls and taxes. Thirty-seven German emperors and 11 empresses have been crowned in this city, and the imperial insignia were preserved here till 1795, when they were carried to Vienna, and are now in the imperial treasury. By the peace of Lunéville (9 Feb. 1801), which separated the left bank of the Rhine from Germany, the city was transferred to France, in whose possession it remained till 1814, when it was restored to Prussia. It was a busy base for military operations during the Franco-Prussian War 1870–71, and during the European War from 1914 was also an important aerial station.

AIX-LA-CHAPELLE, Congress of, an important congress held in October and November 1818. By this congress the army of the allies, consisting of 150,000 British, Russian, Austrian, Prussian and other troops, which, since the second peace at Paris, had remained in France to watch over its tranquillity, was withdrawn after France had paid the contribution imposed at the peace of 1815. Thus the Congress of Aix-la-Chapelle restored independence to France, and readmitted her as one of the Great Powers to the councils of Europe.

AIX-LA-CHAPELLE, Treaties of Peace Concluded at. The first, 2 May 1668, put an end to the war carried on against Spain by Louis XIV in 1667, after the death of his father-in-law, Philip IV, in support of his claims to a great part of the Spanish Netherlands, which he urged in the name of his queen, the Infanta Maria Theresa, pleading the *jus devolutionis* prevailing among private persons in Brabant and Namur. The second peace of Aix-la-Chapelle, 18 Oct. 1748, terminated the Austrian War of Succession in which the parties were at first Louis XV of France and the Empress Maria Theresa and, in the sequel, Spain on the one side and Great Britain, Maria Theresa and Charles Emmanuel, King of Sardinia, on the other.

AIX-LES-BAINS, -lā'băn', France, town in the Savoie department near Lake Bourget; 848 feet above sea-level; 18 miles by rail north of Marseilles. It is a fashionable watering place visited annually by thousands for the hot sulphurous springs, used internally and for bathing ever since the establishment there in Roman days of the 'Aquæ Gratianæ — the Baths of Gratian.' Resident pop. 5,000.

AJACCIO, ä-yä'chō, or **AJAZZO,** ä-yät'zō, France, capital of the department and island of Corsica, on its southwest coast, on a tongue of land projecting into the Gulf of Ajaccio. It is sheltered by mountains from the north and east winds; and the town and bay are defended by a citadel. The entrance into the harbor is rendered unsafe by projecting rocks. Ajaccio is the birthplace of Napoleon; the house in which he was born is still in a state of good preservation and has become the property of the nation. It is the handsomest city of Corsica and the seat of a bishop. It contains a cathedral, a communal college, a public library, a botanical garden, etc. In the commercial world it is famous for its coral and sardine fisheries, and it has also a trade in wine, grain, olive-oil and fruits. During the European War its importance was increased as a naval base for the allied fleets operating in Mediterranean waters.

AJALON, ăj'ą-lŏn, said to be the modern Yâlo, a village 14 miles west-northwest of Jerusalem, was the town rendered memorable by Joshua's victory over the five Canaanitish kings, and still more so by the extraordinary circumstance of the miraculously lengthened day.

AJAX (Greek, *Aias*), the name of two of the Grecian chiefs who fought against Troy, distinguished as Ajax Oileus and Ajax Telamonius. The former, the son of Oileus and Etiopas, a Locrian, was called the Less. When the Greeks had entered Troy, Cassandra fled to the temple of Pallas, whence she was forced and dragged along, bound as a captive. Some accounts add that he violated the prophetess in the temple of the goddess. Ulysses accused him of this crime, when he exculpated himself with an oath. But the anger of the goddess at last overtook him and he perished in the waves of the sea. The other Ajax was the son of Telamon, from Salamis, and a grandson of Æacus. He understood not how to speak, but how to act. After the death of Achilles, when his arms, which Ajax claimed on account of his courage and relationship, were awarded to Ulysses, he was filled with rage, and, driven to frenzy, threw himself on his sword, after having slaughtered the sheep of the Greek army, which he fancied were his enemies.

AJMERE, ąj-mēr', India, capital of the district and province of Ajmere-Merwara, on the Rajputana Railway, 275 miles south of Delhi. Ajmere was founded 145 A.D., and the ancient section is rich in historical interest. The modern city is well laid out with broad streets, fine stores and handsome residences. It is the seat of the Mayo Rajkumar College established in 1875 for the sons of native nobles. Pop. of city, 86,500. Area of province, 2,700 square miles; pop. of province, 501,500.

AKABAH, ā'ka-bä, Arabia, town of historic and strategic interest at the head of the Gulf of Akabah, identified with the Græco-Roman Ælana and the scriptural Elath, whence Solomon's fleet sailed for Ophir. A branch line joining Akabah to the Mecca Railway from Beirut was begun in 1906. The GULF OF AKABAH, the Ælanitic Gulf of the ancients, is the eastern of the two inlets into which the Red Sea divides at its northern end. It is from 12 to 17 miles wide and extends for about 100 miles in a northeasterly direction, bounding the mountainous peninsula of Sinai on the east.

AKBAR, äk'bèr, **the Great**, properly JELAL ED DIN MOHAMMED, most noted of the Great Moguls, Emperor of Hindustan: b. Amerkote, 14 Oct. 1542; d. Agra 1605. His father, Humayun, was driven from the throne by usurpers and fled to Persia. It was during this flight that Akbar was born. After an exile of 12 years the father returned and succeeded in recovering his throne, but died within the year. Akbar succeeded him at the age of 14 and at first the administration was placed in the hands of a regent, but in 1560 he asserted his strong personality and took the reins of power into his own hands. At this time the territory under the rule of Delhi was limited to a few provinces. Within 12 years Akbar had conquered and consolidated under his administration the whole of Hindustan north of the Deccan. But although great in war, he was even more able as an administrator, being unexcelled, or even unequaled, by any of his predecessors or successors. He threaded his dominions with roads, established a uniform system of weights and measures and organized a vigorous civil police system. His powerful influence rested more on his strong sense of justice than on the military power with which he had first subdued his enemies. For the proper levying of taxes, the lands were accurately surveyed and a careful census of the population taken. He forbade child marriages, encouraged widows to remarry and attempted to put an end to the hideous practice of suttee, whereby wives were burned on the funeral pyres of their husbands. Although a Mohammedan by faith, he was wonderfully tolerant of other forms of belief and even invited Christian missionaries into the country. Schools were established for Hindus as well as for Mohammedans and numbers of Hindu works were translated from the Sanscrit into Persian. Abu-l Fazl (q.v.), his able vizier, has left detailed records of the entire administration of his reign in a work which has been translated into English by Gladwin under the title 'Institutes of Akbar' (3 vols., Calcutta 1786 and London 1800). He was succeeded by his son Selim, also known as Jehangir, in 1605. Consult Malleson, 'Akbar' (Rulers of India series, Oxford 1891–1901); Garbe, 'Kaiser Abkar von Indien' (1909); Modi, 'Parsees at the Court of Akbar' (1903).

AKED, ā'kĕd, **Charles Frederick**, Anglo-American clergyman: b. Nottingham, England, 27 Aug. 1864. He began his career as auctioneer to the sheriff of Derbyshire, but later entered as a student in the Midland Baptist College. He first attracted attention in Liverpool as a speaker and his congregation there became one of the largest in England. During the Boer war he was one of those who founded the Passive Resistance League whose object was to put an end to that war, and this made him, for a time, very unpopular. In 1907, through the influence of John D. Rockefeller, he received a call to the pastorate of the Fifth Avenue Baptist Church, New York. In 1911 he went to San Francisco, where he became pastor of the First Congregational Church. In 1913 he became a citizen of the United States. Among his published writings are 'The Courage of the Coward' (1905); 'A Ministry of Reconciliation' (1907); 'Mercies New Every Morning' (1907); 'Wells and Palm Trees' (1908); 'Old Events and Modern Meanings' (1908); 'The Lord's Prayer; Its Meaning and Message for To-day' (1910).

AKEE (*Blighia sapida*), fruit tree of the family *Sapindaceæ*. It is a native of tropical Africa, reaches a height of 25 feet or more, with numerous branches. Its leaves resemble those of the ash. The fruit is about the size of a goose's egg, contains three seeds and has a grateful flavor. With sugar and cinnamon it is used as a remedy for diarrhœa. The distilled water of the flowers is sometimes used as a cosmetic. Sometimes by cramping the roots in pots the akee produces fruit in hothouses.

AKENSIDE, Mark, English physician-poet: b. 9 Nov. 1721; d. 23 June 1770. He achieved literary fame at the age of 23 with his poem 'Pleasures of the Imagination' (3 vols., London 1744), didactic verse based largely on Addison's essays on the imagination and on Lord Shaftesbury's writings. Among his minor verse are 'Ode on the Winter Solstice' and 'Hymn to the Naiads.' Consult Buckle, C., 'Life, Writings and Genius of Akenside' (London 1832).

AKERS, Peter, American clergyman and educator: b. Campbell County, Va., 1 Sept. 1790; d. Jacksonville, Ill., 21 Feb. 1886. He received his education in the common schools and pursued a classical course in higher institutions of learning in Virginia and North Carolina. In 1817 he was admitted to the bar and formed a partnership with Maj. W. P. Fleming of Kentucky. In 1822 he entered the ministry of the Methodist Episcopal Church. He served many years as presiding elder. In 1827 and 1831 he was financial agent of Augusta College. In 1833–34, 1852–57 he was president of McKendree College, Lebanon, Ill. He was a delegate to six General Conferences of his church.

AKHALTSIKH, ä'käl-tsĕk', Russia, chief town of a district in the government of Tiflis, the former capital of Turkish Armenia from 1579 to 1828, 70 miles by rail east of Batum. The river Kura divides the old town and fortress on the left bank from the new town on the right. Coal and lignite are mined, firearms, small weapons, silver filigree work are manufactured, and a thriving trade in these and in the silk, grain, honey and wax of the neighborhood is carried on with Black Sea ports. Pop. 15,000.

AK-HISSAR, äk'hĭs-sär', Turkey in Asia, a town in the vilayet of Smyrna, 50 miles by rail northeast of Smyrna. It is the biblical «Thyatira,» one of the «seven churches of Asia,» a Macedonian colony founded by Seleu-

cus about 290 B.C., and later an important Roman station on the highway from Pergamum to Laodicea. The modern town carries on a busy export trade in locally-grown cotton, wool, silk cocoons, grains and cereals, and has a high reputation for its scarlet dyes. Pop. 20,000.

AKHMIM, ąk-měm′, or **EKHMIM**, Egypt, town on the right bank of the Nile, almost opposite the Suhag station on the Cairo and Assuan Railway, 68 miles by river south of Assiut. Its archæological interest is great. It was the ancient Egyptian Apu or Khen-min, the Coptic Shmin, known to the Greeks through Herodotus, Strabo and other travelers, as Chemmis or Panopolis, the seat of the pagan worship of the ithyphallic Min (Pan) as "the strong Horus." Christian monasteries were early founded here and the pagan temples destroyed. Modern Akhmin is a busy trading centre in cotton and linen goods, and in Coptic and Egyptian antiquities. Pop. 24,000.

AKHTYRKA, ąk-tĭr′ką, Russia, town in the Kharkov government, on the Vorskla River, 82 miles by rail northwest of Kharkov. Its miraculous ikon of the Virgin in the beautiful cathedral built in 1753, and the annual May fair, attract numerous pilgrims and visitors. A busy agricultural trade is carried on and woolens are manufactured. Pop. 26,000.

AKIBA BEN JUDAH, ā-kē′ba ben jöda, a Jewish rabbi who was executed during the reign of Hadrian, about 133, because it is said he taught the Jewish law when it was forbidden to be taught. He was a great scholar in Jewish law and a Mishnah bears his name. He defended the Song of Solomon and interpreted it allegorically. He was an allegorist in his method of interpretation, finding a meaning in even the letters of the law. Aquila, who translated the Old Testament into Greek, is said to have been a pupil of Akiba. The school of which he was head exerted a wide influence.

AKKA, ăk′ką, a tribe of dwarfs inhabiting the Belgian Kongo. The first to report their existence was the Franco-American explorer and writer, Paul du Chaillu, but because his books were written in a simple style, which made them popular with young people, his accounts were not accepted by the scientific world, being regarded as fiction. Later the Akka were discovered by Schweinfurth, who corroborated du Chaillu in every detail. In height these peculiar people average four feet and six inches, and though their features are distinctly negroid they are of a dark yellow complexion. They are extremely retiring by nature, do not mix with the neighboring tribes though often they will seek the protection of the tall negroes. They hunt their game with poisoned arrows, their favorite prey being the python. Their main diet, however, is composed of nuts and berries.

AKKAD, ăk′kad. See ACCAD.

AKKERMAN, ąk′ker-măn′, Russia, fortified town of the Bessarabian government, on the right bank of Dniester estuary, 12 miles from the Black Sea. The harbor has been made navigable for large steamers and an export trade is carried on with Odessa 60 miles distant, in wine, fruits, fish, salt, wool and tallow. The town is noted for its beautiful gardens and vineyards. It dates from the Genoese colony Mauro Castro, founded on the site of Tyras, an ancient Milesian colony. In disputes with the Turks it was repeatedly taken and returned by Russia until its final annexation in 1881. Pop. 34,000.

AKMOLINSK, ąk′mŏ-lyĕnsk, Asiatic Russia, a province organized 2 Nov. 1868 from the Kirghiz Steppe in Central Asia. The Trans-Siberian Railway runs along its northern border and the province extends southward to the Chu River. Akmolinsk, the former capital, a city of 12,000 inhabitants, is an important trading centre for the caravan trade with Bokhara and Tashkend. Omsk (q.v.) founded in 1862, the most important city, is since 1882 the capital of the province. Coal, iron, copper and gold are mined and among the chief industries are horse-breeding, cattle- and sheep-raising, fishing, hunting and the cultivation of grain, flax and tobacco. The stationary population live mostly in the northern and central hilly section. The Khirgiz nomads who constitute about half the population wander and encamp over the southern regions. Area of province 218,480 square miles; pop. 1,060,000.

AKRON, Ohio, city and county-seat of Summit County, situated in a range of hills overlooking the Big and Little Cuyahoga Rivers, 35 miles southeast of Cleveland and 130 miles northeast of Columbus. Akron is entered by the Baltimore & Ohio, Pennsylvania, Erie, Akron, Canton & Youngstown, and Northern Ohio railroads. The town was settled about 1818 but its growth dates from the construction of the Ohio Canal in 1825, here mounting to the watershed between Lake Erie and the Ohio River by a series of 21 locks, the surplus water used in lockage furnished by a system of reservoirs on the Summit level supplying the power for large flouring mills then located here. Akron was incorporated as a village in 1836 and as a city in 1865. Situated in a location advantageous for diversified industries at the northern edge of the grain belt and on the southern border of the dairy section of the State, with beds of fireclay and coal fields close by, Akron has developed the largest cereal mills in the country, the most extensive clay-product plants, has taken the lead in books, fishing-tackle, matches and agricultural implements, and is the largest rubber-manufacturing centre in the world. Besides immense quantities of rubber clothing, hose, surgical and other goods, 20 companies have a daily capacity of 40,000 automobile tires and an increasing output of aviation and aeronautical material. The aggregate capitalization of its 164 industries is $175,000,000; combined value of annual sales (1915) $156,177,993. Akron is governed by a mayor, council, board of public service, board of public safety, board of education and subordinate officers. The school system alone involves the annual expenditure of $350,000 in salaries, and is of a high and efficient grade. The University of Akron, a free city institution, dates from 1913 and was previously known as Buchtel College (Universalist) (q.v.), founded by John R. Buchtel, the cornerstone of which was laid by Horace Greeley in 1872. Akron has fine public institutions and residential buildings, large department stores, a completely motorized fire department, a municipal water system completed

(1915) at a cost of $4,580,000; a municipal garbage and sewage plant which cost $550,000, 17 parks covering 219 acres, four public playgrounds, and a "white way" system of lighting three miles long. It is the centre of a lake district famous for its scenic attractions, including Portage Path, an Indian trail between the Cuyahoga and Tuscarawas rivers, which formed part of the western boundary of the United States in 1785. Akron was once the home of John Brown, where the councils of his associates in the abolition cause were held. It was also the residence of Sidney Edgerton, first chief justice of Idaho Territory and first territorial governor of Montana. Pop. (1915) 100,079, an increase of 45 per cent in five years from (1910) 69,067. Pop. of Greater Akron, including suburbs (1916), 120,000. Consult Lane, S. A., 'Fifty Years and Over of Akron and Summit County' (Akron 1892); 'Akron —The City of Opportunity' (Akron Chamber of Commerce 1916).

AKSAKOFF, ak-sä'kŏf, **Ivan Sergeyevich,** Russian writer and leader of the Panslavist movement: b. government of Ufa, 26 Sept. 1823; d. 8 Feb. 1886. Having graduated from his law studies in Saint Petersburg in 1842, he entered the Moscow division of the Senate. In 1848 he entered the service of the ministry of the interior. Four years later he became editor of *Sbornik* in Moscow, which was soon suppressed. During the Crimean war he served in Bessarabia in command of the Serpukhoff detachment of the Moscow troops. After the war he founded a weekly journal called *Den,* which he edited for four years, after which he founded and edited a daily paper called *Moskva.* This latter paper was suppressed three times by the government within two years. He was one of the leaders of the movement toward the union of all the Slavic peoples into one great empire and he had not a little influence in precipitating the Russo-Turkish war of 1877, which resulted in the liberation of Rumania and Bulgaria. From 1880 until his death he published the weekly *Rus* in the interests of Panslavism.

AKSAKOV, Sergei Timofeyevich, Russian writer: b. in the government of Ufa, 20 Sept. 1791; d. Moscow, 30 April 1859. On graduating from the University of Kazan he entered the legislative commission in Saint Petersburg in 1807, where he served for five years. Already at the age of 15 he began to write and was for the rest of his life ever busy producing literature. His works are 'Observations on Angling' (1847); 'Memoirs of a Huntsman in the Government of Orenburg' (1852); 'Tales and Memories of a Huntsman' (1855); 'The Family Chronicle' (1856); 'Bogrov's Childhood' (1858).

AKSAKOV, Konstantin Sergeievich, Russian historian and publicist: b. 1817; d. 1860. He grew up in the village of his birth but when his parents moved in 1826 to Moscow he came suddenly, as a nine-year-old boy, into the midst of the high life of Russian society. From his earliest childhood he manifested a strong love for everything Russian and particularly for things of Old Russia. He was able to read at four years of age and by the time he was 12 years old he had already read the entire classical literature. His education was completed at home with the aid of some of the most able preceptors, as also by the professors of Moscow University where he studied comparative literature. Having finished his studies at the University in 1835, he dedicated himself entirely to literature: at first in the field of criticism and poetry and later, of history. In 1847 he defended successfully his doctorate thesis, 'Lomonosov in the History of the Russian Literature and Language.' In 1850 Aksakov wrote for the National Theatre of Moscow a historic patriotic drama, 'Liberation of Moscow in 1612,' which was suppressed the next day by the authorities because of his claims that Moscow was freed by the peasantry and not by the nobility. Some of his publications ('The Wealthy Prince Vladimir,' etc.) were not only censured, but even caused their author's arrest. His historic comedies 'Prince Lipovitzki' (1856) in which he glorifies the national Russian genius triumphing over the "venomous" Western civilization, and 'Oleg at the Gates of Constantinople' do not show a powerful playwright, but may be considered as valuable historic studies with weak dialogue. His efforts in the field of Russian philology were crowned with more success as he proved the evil to the Russian idiom caused by the inroads of foreign languages. In his treatise 'On the Fundamental Principles of Russian History' (1861) Aksakov distinctly separates the people from the government and asserts that between them exists a permanent chasm bridged by mutual concessions.

AK-SHEHR, äk-shĕ'h'r ("white city"), Turkey in Asia, a city of the Konieh vilayet, on the north slope of the Sultan-Dagh, five miles south of Lake Ak-Shehr and 100 miles by rail northwest of Konieh. It abounds in historical interest. Mentioned in the martyrdom of Polycarp and in the correspondence of Cicero; it is the Philomelium of Strabo; the burial place of Nur-eddin Khoja; here in 1190 Frederick I, the German Emperor, fought a battle with the Seljuks; and here in 1403 the Sultan Bajazet I died while a prisoner in the fortified camp of Tamerlane. The modern city manufactures carpets of repute and is an important trading-centre between Constantinople and Syria. Pop. 15,000.

AKSU, ąk-soo' ("white water") China, a town of East Turkestan, on the Aksu River and the southern slope of the Tien-shan Mountains, about 250 miles northeast of Kashgar. It is a great caravan-centre for Chinese, Russian, West Turkestan, Kashmir and Indian traders and its industrious and hospitable inhabitants manufacture unglazed "bias" cotton cloth, ornamented saddlery of deerskin, jewels and jasper ornaments. Copper, iron and lead deposits nearby are mined by Chinese convicts. Aksu was the former capital of the Khans of Kashgar and Yarkand. In 1867 the Khan of Kashgar regained it, only to lose it again to the Chinese in 1877. It was almost destroyed by an earthquake in 1716 and in 1800 was flooded by a freshet in which 3,000 lives were lost. Pop. 25,000.

AKTIAN DEPOSITS. See CONTINENTAL SHELF.

AKYAB, ak-yāb', India, seaport town of Burma, capital of the district of Akyab and of the province of Arakan, 190 miles southeast of Calcutta on the eastern coast of Akyab Island, at the confluence of the Kuladan, Myu and Lemyu rivers. A former fishing village, it has become a flourishing town since its selection in 1826 as a port and the capital of the province. The chief exports are rice and oil. Pop. 40,000.

AL, or EL, the Arabic definite article; also means "of the": al abdu = the slave; abdu 'l malik = slave of the king. In Arabic the following consonants are called "sun letters": Té, thé dal, dzal, ré, zé, sin, shin, sad, dad ta, tsa, nun. When a noun or a name beginning with one of these letters follows the article, the *l* is then dropped and the sun letter is doubled, e. g., Noor-el-deen (light of the faith), becomes Nooreddeen; koh-el-noor (mountain of light), is pronounced koh-en-noor. Similarly, Abdu el Rahman (slave of the merciful) is pronounced "Abdurrahman;" el shems (the sun), esh-shems.

ALABAMA. A Gulf State of the United States, the ninth in order of admission to the Union. It is bounded on the north by Tennessee, south by Florida and the Gulf of Mexico, east by Georgia, west by Mississippi. Its extreme length is about 336 miles from north to south; its greatest breadth 200 miles; its area 51,998 square miles, of which 719 square miles is water. The population as estimated in 1916 was 2,332,608, of which 58 per cent are white. In 1910, Alabama ranked as the 18th State of the Union in population and the 27th in area. It is divided into 67 counties. The capital is Montgomery.

Topography.— The State lies partly in the Gulf Coastal Plain and partly in the Appalachian Highland which extends in the United States from Maine to middle Alabama. A southward bending arc drawn from the northwest corner of the State to Columbus, Ga., divides it into two distinct regions, the northeastern, the southern extremity of the Appalachian, a mountainous section; the southwestern, belonging to the Gulf Coastal Plain. The mountain portion contains all the features of the Appalachian system. (1) A Piedmont region in the east, called the Ashland Plateau. (2) Ajacent to the Piedmont, a number of parallel mountain ridges, with valleys between, extending from northeast to southwest, which gradually reduce in elevation to the southern plain. (3) On the west a hilly region, the southern end of the Cumberland Plateau.

The average elevation of the State is approximately 600 feet. In the north and east the surface is generally above this level; in the south and west, below it. The greatest elevation is 2,500 feet, found in the sharp crested Talladega ridges composed of granite, slate and marble. These represent the extreme southern end of the Blue Ridge of the Appalachians. The great Tennessee River enters Alabama at the northeast corner from the State of Tennessee between two parallel ridges. At Guntersville it turns abruptly to the northwest and flows through the valley which it has made across the Cumberland Plateau and emerges from the State at its northwest corner.

The coast line of the State is about 120 miles in length including both shores of Mobile Bay, an inlet 36 miles long and from 8 to 18 miles in width with a channel 30 feet deep in course of construction. The smaller bays are Perido, Grand and Bon Secours.

Hydrography.— There are three major and two minor drainage basins in the State:

Major.—(1) The Mobile; (2) the Tennessee; (3) the Chattahoochee.

Minor.—(1) The Conecuh, forming the Escambia of Florida; (2) the Choctawhatchee.

The Mobile system drains the greater part of the State. Mobile River, 44 miles long, is formed from the Alabama and the Tombigbee, both crooked alluvial streams. The Alabama is navigable 320 miles to the junction of its two chief tributaries, the Coosa and the Tallapoosa. The Coosa, since the completion of several great locks by the Federal government, is navigable to Rome, Ga., and its falls are the source of immense water power. The Cahaba, another tributary of the Alabama, enters it from the north and flows through important coal fields.

The Tombigbee, 500 miles in length, has its remoter sources in Mississippi. Its chief tributary in Alabama is the Black Warrior, 300 miles long, rising on the divide near the great bend in the Tennessee River. This tributary flows through the greatest coal measures of Alabama, and has been made navigable by a series of locks and dams built by the Federal government.

The Tennessee, chief affluent of the Ohio, is navigable from its mouth to Knoxville, Tenn., about 700 miles, 300 of which lie in Alabama. Navigation on this was originally interrupted by mussel shoals, but now a canal with nine locks is in operation, extending 28 miles between Decatur and Riverton. The power available at the foot of the shoals in this mighty stream is second only to that of Niagara.

The Chattahoochee, flowing between Georgia and Alabama, is navigable to the "Fall-line" where the stream leaves the Piedmont and enters the Coastal Plain, a distance of about 200 miles.

The Conecuh and Choctawatchee are shallow streams of the Coastal Plain, used for floating rafts of logs to the Gulf. Alabama is classed as one of the four great river States of the United States. Its streams furnish steam navigation for nearly 3,000 miles.

Climate.— Lying between parallels 31–35, the State has a range of climate from temperate in the northern mountainous portion, to semi-tropical in the low-lying counties of the southern part bordering the Gulf. The annual mean temperature for the entire State is 63°; average rainfall, 52 inches. Throughout the State there is an average of six months without frost. All the climate conditions favor the growth of cotton, corn, peanuts and other leguminous plants.

Geology.— All the Appalachian formations are found here in three divisions: (1) A northwest section showing subcarboniferous limestone masses and coal measures, with strata practically horizontal. (2) A northeast section having metamorphic and calcareous rocks, —Silurian quartzites, marbles, granites and gneisses, the strata often broken into masses of

clay interlaminated with quartz seams; the Coosa and Cahaba coal fields showing strata of sandstones, conglomerates, shales and coal beds. (3) A southern section, part of the Gulf Coastal Plain, having drift beds over Cretaceous and Tertiary rocks. The angle between the Alabama and Tombigbee rivers is rich in fossil remains of the Tertiary Age. Consult Geologic Map published by Geological Survey of Alabama.

Soils.— The soils are (1) residual, and (2) sedimentary. The residual soils, being derived from underlying rocks, vary from clay to sand, according to the substratum. The Coosa and Tennessee valleys underlaid with limestone are overlaid with fertile red clay, while the adjacent highlands are covered with sandy soil varying in color. The Coastal Plain is composed of many overlapping strata of sedimentary material, limestone, sandstone, clay, each outcropping stratum being overlaid with its appropriate soil. Overlying the western and southern part of the State is the remnant of a mantle of sand, gravel and loam in the form of gravelly hills of moderate fertility, but chiefly forested. Between the northern mountainous region and the southern plain lies an inner lowland extending across the State from east to west. This shallow trough, about 25 miles in width, has been eroded out of the belt of chalky limestone of the Cretaceous deposits, the rock of which has weathered into a dark soil of great depth and fertility. This lowland is the famous Black Belt, having a soil of enduring quality. Most of the rivers of the lowlands have made flood plains of rich alluvial soil.

Fisheries.— Oyster-dredging is the chief branch of the fishing industry, an average annual yield being 535,000 pounds valued at $168,500. Red snappers, catfish, mullet and shrimp also furnish profitable yields. The average annual value of the total product of the Alabama fisheries amounts to $387,000.

Minerals and Mining.— The mineral wealth of the State is enormous, practically all of it lying in (1) and (2) of the geologic regions. The advantage of vast coal, iron, limestone and dolomite (magnesian limestone) deposits lying close together has within the past 20 years raised the State from an almost purely agricultural section to one of the chief manufacturing districts of the Union with its centre at Birmingham. It is said that iron products can be manufactured more cheaply there than anywhere else because of the proximity of coal, iron and fluxing material. The mineral wealth of Alabama lies chiefly in her rich deposits of coal and iron ore. The former brings her two-thirds of her annual income from mines and quarries, and the latter about one-fourth. Beyond the first value of these raw materials, however, they form the bases of two thriving industries — the manufacture of pig-iron and of coke — through both of which the State takes high rank among the mineral-working States in the Union. In 1916 Alabama produced 5,976,018 tons of iron ore, which, though it amounted to only about 8 per cent of the total yield of the whole country, placed the State in third place among the iron ore producers — following Minnesota and Michigan — and the yield was five times as much as that of Wisconsin, the fourth in rank in that industry. The incompleteness of the returns for 1916 of the mineral industries of Alabama at this writing (October 1917) makes it necessary to revert to the record of 1915 for a unified statement. In 1915, then, the production of raw mineral substances in the State reached a total value of $29,457,407. This was distributed as follows:

Coal	$19,066,043
Iron ore	6,798,266
Clay products	1,193,022
Cement	891,183
Marble and other stone	719,452
Lime	250,227
Sand and gravel	242,336
Graphite	204,572
Miscellaneous	92,306

Some of these items, as the clay products, cement and lime, are advanced by treatment beyond the raw stage; the stone is more or less dressed before being placed on the market; and the graphite is milled. But it is the custom of the Geological Survey to enumerate such productions among the mineral products of the several States and this practice is followed here. A very considerable secondary value, arising from the conversion of coal into coke, and of iron ore into pig iron should be noted, as inseparably connected with the mineral output of the State. In 1915 the pig iron produced was valued at $23,757,124; and the coke production was valued at $8,505,555.

Coal.— The great Appalachian coal region which includes the world-famous mining section of Pennsylvania and Ohio, trends southwestward through eastern Kentucky and Tennessee, having its southerly terminus in a broad area in the northern half of Alabama. The coal formations in this State underlie about 8,400 square miles distributed in four distinct measures: the Warrior, the Cahaba, the Coosa and the Plateau. The first named includes all of Walker County and most of Jefferson, Tuscaloosa and Fayette counties, with parts of Blount, Culman, Winston and Marion counties. This great area embraces about 4,000 square miles and supplies over 80 per cent of all the coal mined in the State. The Cahaba measures underlie parts of Saint Clair, Jefferson, Shelby and Bibb counties, and supply more than 18 per cent of the State's total output. The other two measures though they are known to contain immense quantities of coal, have but few mines and together supply less than 2 per cent of the coal mined in the State. Nearly half of the entire output is mined in Jefferson County, nearly one-fourth in Walker County and about one-eighth in Bibb County. About 35 per cent of the product is mined by machines, 31 per cent by hand and 33 per cent is blasted off the solid. The coal production of Alabama in 1915 was 14,927,937 tons, valued at the mines at $19,066,043. The highest output was in 1910 when 16,111,462 tons were mined. In 1870 the output was 13,200 tons. Of the coal output of 1915, 49 per cent was consumed in the State, 34 per cent by railroads, 14 per cent was shipped to other States and 3 per cent was shipped to tidewater. The amount consumed by the railroads was 5,072,435 tons; 4,695,938 tons were made into coke; 2,389,397 tons were consumed in industrial plants; 1,592,932 tons were used for domestic and local purposes; 535,340 tons were used at the mines; 109,160 tons in the manufacture of gas; and 480,258 tons were shipped to tidewater as bunker coal. From 1840, when records

ALABAMA

Estimated population, 2,395,270

COUNTIES

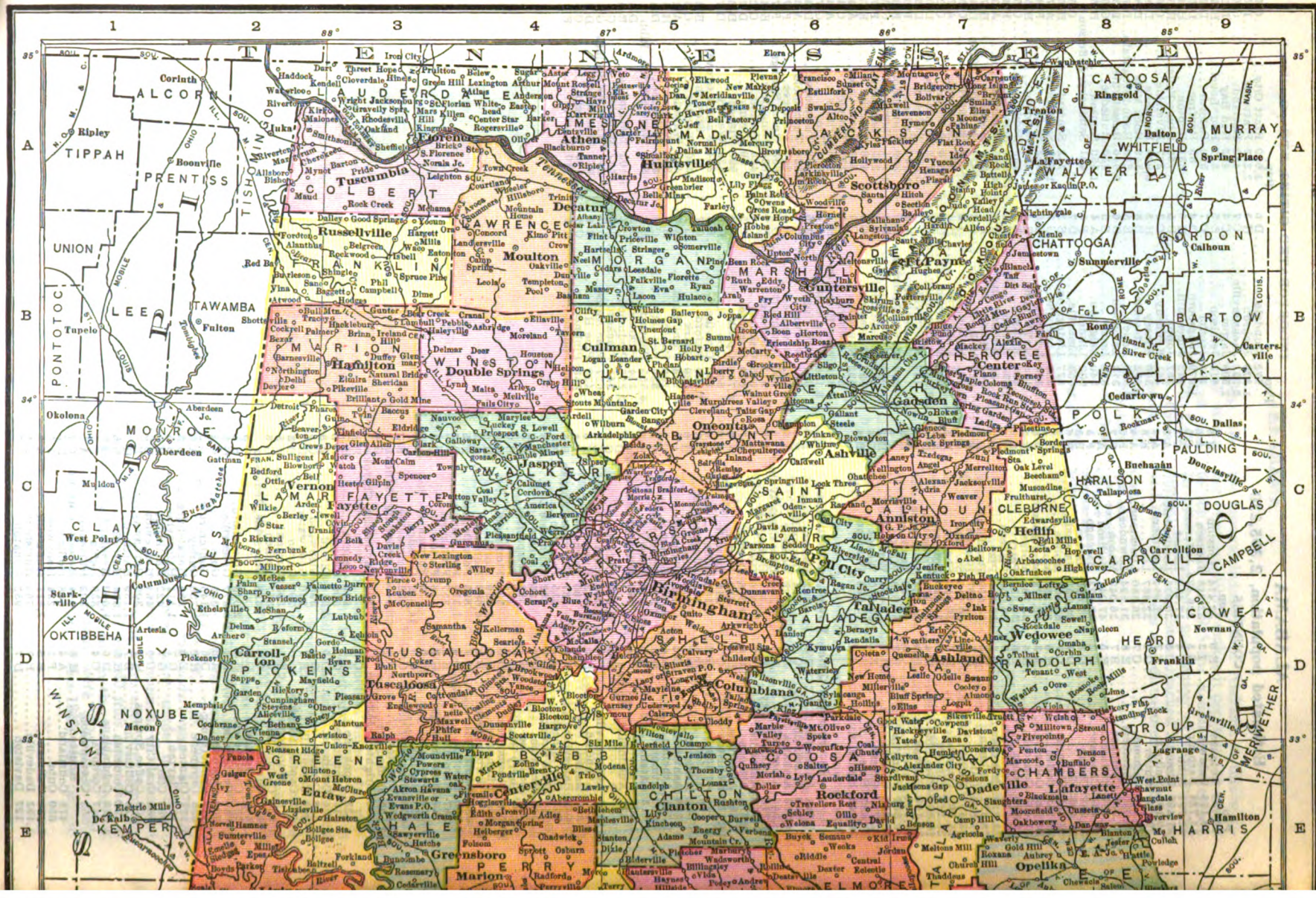
Pop.			Pop.		
20,038	Autauga	E 5	32,414	Houston	H 8
18,178	Baldwin	I 3	32,918	Jackson	A 6
32,728	Barbour	G 8	226,476	Jefferson	C 5
22,791	Bibb	E 4	17,487	Lamar	C 2
21,456	Blount	C 5	30,936	Lauderdale	A 3
30,196	Bullock	F 7	21,984	Lawrence	A 4
29,030	Butler	G 5	32,867	Lee	E 3
39,115	Calhoun	C 7	26,880	Limestone	A 4
38,056	Chambers	E 3	31,894	Lowndes	F 5
20,226	Cherokee	B 7	26,049	Macon	F 7
23,187	Chilton	E 5	47,041	Madison	A 5
18,483	Choctaw	G 2	39,923	Marengo	F 3
30,987	Clarke	G 3	17,495	Marion	B 3
21,006	Clay	D 7	28,553	Marshall	B 6
13,385	Cleburne	C 7	80,854	Mobile	I 2
26,119	Coffee	H 6	27,155	Monroe	H 4
24,802	Colbert	A 3	82,178	Montgomery	F 6
21,433	Conecuh	H 4	33,781	Morgan	B 5
16,634	Coosa	E 6	31,222	Perry	E 4
32,124	Covington	H 6	25,055	Pickens	D 2
23,313	Crenshaw	G 6	30,815	Pike	G 7
28,321	Cullman	B 5	24,659	Randolph	D 3
21,608	Dale	H 7	25,937	Russell	F 3
53,401	Dallas	F 4	20,715	St. Clair	C 6
28,261	Dekalb	B 7	26,949	Shelby	D 5
28,245	Elmore	E 6	28,699	Sumter	E 2
18,889	Escambia	H 4	37,921	Talladega	D 6
39,109	Etowah	B 6	31,034	Tallapoosa	E 7
16,248	Fayette	C 3	47,559	Tuscaloosa	D 3
19,369	Franklin	B 3	37,013	Walker	C 4
26,230	Geneva	H 7	14,454	Washington	H 2
22,717	Greene	E 2	33,810	Wilcox	G 4
27,683	Hale	E 3	12,855	Winston	B 4
20,943	Henry	G 8			

Incorporated Cities, Towns, and Villages

Pop.			Pop.		
1,141	Abbeville	G 8	382	Dayton	F 3
649	Adamsville	C 5	194	Deatsville	E 6
4,313	Alabama City	B 7	4,228	Decatur	A 4
1,544	Albertville	B 6	279	Deer Creek, Walker	C 4
1,710	Alexander City	E 7	2,417	Demopolis	F 3
640	Aliceville	D 2	916	Dora	C 4
1,071	Altoona	B 6	7,016	Dothan	H 7
2,480	Andalusia	H 5	288	Dozier	H 6
14,112	Anniston	C 7	315	Eclectic	E 6
431	Ariton	G 7	165	Eden	C 6
479	Ashford	H 8	393	Edwardsville	C 3
1,062	Ashland	D 7	1,079	Elba	H 6
278	Ashville	C 6	188	Elkmont	A 4
1,715	Athens	A 4	8,000	Ensley	C 5
1,060	Atmore	H 3	2 322	Enterprise	H 7
2,513	Attalla	B 6	374	Epes	E 2
1,408	Auburn	F 7	94	Estaboga, Talladega	D 6
671	Austinville, Morgan	B 5	4,259	Eufaula	G 8
313	Autaugaville	F 5	1,001	Eutaw	E 3
3,600	Avondale	D 5	1,582	Evergreen	H 5
307	Banks	G 7	590	Fairhope	J 3
143	Batesville	F 8	237	Fairview, Morgan	B 5
749	Bay Minette	I 3	335	Falkville	B 5
214	Bear Creek	B 3	352	Faunsdale	F 3
345	Beatrice	G 4	636	Fayette	C 3
201	Bellwood	H 7	398	Fitzpatrick	F 7
372	Berry Station	C 3	197	Flint	B 4
16,556	Bessemer	D 5	539	Flomaton	H 4
256	Billingsley	E 5	2,439	Florala	H 6
181,762	Birmingham	D 5	6,689	Florence	A 3
485	Black	H 7	893	Fort Deposit	F 5
3,500	Blocton	D 4	1,317	Fort Payne	B 7
287	Blountsville	B 5	257	Fruithurst	C 7
117	Blue Springs	G 7	518	Fulton	G 3
1,010	Boaz	B 6	125	Furman	G 5
350	Bolling	G 5	14,642	Gadsden	C 7
803	Brantley	G 6	532	Gainesville	E 2
2,185	Brewton	H 4	145	Gastonburg, Wilcox	G 4
2,125	Bridgeport	A 7	204	Gaylesville, Cherokee	B 7
1,502	Brighton, Jefferson	C 5	969	Geneva	H 7
623	Brookside	C 5	999	Georgiana	G 5
815	Brundidge	G 7	4,214	Girard	F 8
754	Calera	D 5	336	Glenwood	G 6
648	Camden	G 4	740	Goodwater	D 7
896	Camp Hill	E 7	707	Gordo	D 3
403	Capital Heights, Montgomery	F 6	293	Gordon	H 8
1,627	Carbon Hill	C 3	347	Goshen	G 6
426	Cardiff	C 5	428	Graysville, Jefferson	C 5
444	Carrollton	D 3	2,048	Greensboro	E 3
225	Castleberry	H 4	3,377	Greenville	G 5
730	Centerville	E 4	356	Guin	C 3
269	Cherokee	A 2	1,145	Guntersville	B 6
449	Childersburg	D 6	750	Gurley	A 6
935	Citronelle	H 2	286	Hackleburg	B 3
1,123	Clanton	E 5	1,111	Haleyville	B 3
1,130	Clayton	G 7	422	Hamilton	B 3
580	Clio	G 7	464	Hanceville	B 5
685	Coal City	C 6	300	Hardaway	F 7
503	Coffee Springs	H 7	1,159	Hartford	H 7
673	Collinsville	B 7	1,374	Hartsell	B 5
1,122	Columbia	H 8	1,090	Headland	H 8
1,079	Columbiana	D 6	839	Heflin	C 7
1,747	Cordova	C 4	202	Hillsboro	A 4
352	Cottonwood, Houston	H 8	344	Hobson, Calhoun	C 7
478	Courtland	A 4	688	Hollins	D 6
650	Cuba	F 2	234	Hollywood	A 6
2,130	Cullman	B 5	7,611	Huntsville	A 5
1,193	Dadeville	E 7	764	Hurtsboro	F 8
127	Daviston	D 7	982	Ironaton	D 7

INCORPORATED CITIES, ETC.—Continued

Pop.			Pop.		
572	Irondale	D 5	3,600	Pratt City	C 5
1,379	Jackson	H 3	2,222	Prattville	F 5
2,231	Jacksonville	C 7	483	Ragland	C 6
2,509	Jasper	C 4	472	Red Bay	B 2
413	Jemison	E 5	317	Red Level	H 5
104	Jenifer	C 7	550	Reform	D 3
1,979	Jonesboro	D 4	85	Renfroe	D 6
442	Jones Mill	H 3	331	Repton	H 4
167	Joppa	B 5	760	River Falls	H 5
261	Kennedy	C 3	277	Riverside	C 6
340	Kinsey	H 8	2,034	Roanoke	D 8
1,632	Lafayette	E 8	349	Rock Mills	D 8
3,820	Lanett	E 3	210	Round Mountain	B 7
314	Langston	B 6	2,046	Russellville	B 3
810	Leeds	C 5	230	Rutledge	G 6
540	Leighton	A 4	1,350	Samson	H 6
600	Linden	F 3	491	Sandusky, Jefferson	C 5
1,053	Lineville	D 7	742	Sanford	H 6
877	Livingston	E 2	1,019	Scottsboro	A 7
483	Louisville	G 7	312	Seale	F 8
1,384	Luverne	G 6	120	Searight	H 5
184	McWilliams	G 4	133	Seddon	C 6
426	Madison	A 5	15,626	Selma	F 4
1,834	Marion	E 4	4,865	Sheffield	A 3
539	Midland City	H 8	896	Slocomb	H 7
464	Midway	F 3	422	Smith Hill, Bibb	D 4
529	Millport	C 2	350	Springville	C 6
58,221	Mobile	I 2	574	Stevenson	A 7
616	Monroeville	H 4	619	Sulligent	C 2
923	Montevallo	D 5	1,456	Sylacauga	D 6
43,285	Montgomery	F 6	5,854	Talladega	D 6
137	Mooresville, Limestone	A 4	1,347	Tallassee	F 6
299	Morris, Jefferson	C 5	309	Thomaston	F 3
354	Moulton	B 4	1,181	Thomasville	G 3
253	Moundville	E 3	263	Thompson	F 7
130	Muscadine	C 8	426	Thorsby	E 5
392	Nauvoo	C 4	344	Town Creek	A 4
515	Newbern	E 3	235	Townley	C 4
328	New Brockton	H 7	198	Trinity	A 4
6,118	New Decatur	A 4	4,961	Troy	G 7
301	New Hope	A 6	10,488	Tuscaloosa	D 3
524	Newton	H 7	3,324	Tuscumbia	A 3
522	Newville	H 8	2,803	Tuskegee	F 7
500	Northport	D 3	4,055	Union Springs	F 7
512	Notasulga	E 7	1,836	Uniontown	E 4
1,065	Oakman	C 4	423	Vernon	C 2
609	Oneonta	C 5	79	Vienna	D 2
4,734	Opelika	E 8	995	Vincent	D 6
863	Opp	H 6	426	Wadley	D 7
255	Orrville	F 4	204	Walnut Grove, Etowah	B 6
1,090	Oxford	C 7	660	Warrior	C 5
2,229	Ozark	G 7	435	Waterloo	A 2
534	Paint Rock	A 6	256	Webb	H 8
530	Pell City	H 8	435	Wedowee	D 8
4,555	Phoenix	C 6	892	West Blocton, Bibb	D 4
214	Pickensville	F 8	1,103	Wetumpka	E 6
2,226	Piedmont	D 2	187	Whatley	G 3
541	Pinckard	C 7	249	Whiteoak Springs	G 8
627	Pine Apple	H 7	933	Wilsonville	D 5
470	Pine Hill	G 5	419	Winfield	C 3
358	Pinkney	G 4	710	York	F 2
599	Pollard	C 6			


TENNESSEE
MISSISSIPPI
ALABAMA
ALCORN
TIPPAH
PRENTISS
TISHOMINGO
LAUDERDALE
LIMESTONE
MADISON
JACKSON
DEKALB
CATOOSA
WHITFIELD
MURRAY
WALKER
CHATTOOGA
GORDON
Calhoun
Summerville
Fort Payne
Scottsboro
Huntsville
Athens
Florence
Tuscumbia
Russellville
Decatur
Moulton
Somerville
Guntersville
Albertville
Boaz
Gadsden
Rome
Cartersville
Cedartown
Dallas
PAULDING
HARALSON
DOUGLAS
CARROLL
COWETA
HEARD
Franklin
TROUP
LaGrange
Lafayette
Dadeville
Opelika
Auburn
Tuskegee
MACON
BARBOUR
HARRIS
Hamilton
Buchanan
Douglasville
Carrollton
Newnan
Talladega
Sylacauga
Anniston
Oxford
Jacksonville
Piedmont
Ashville
Pell City
Birmingham
Bessemer
Tarrant City
Fairfield
Gadsden
Attalla
Alexandria
Jacksonville
Weaver
Heflin
Cleburne
Edwardsville
Lineville
Wedowee
Ashland
Roanoke
Randolph
Clay
Coosa
Chambers
Tallapoosa
Haralson
Polk
Bartow
Floyd
Cherokee
Center
Forney
Piedmont
Springs
Oak Level
Beecham
Fruithurst
Muscadine
Arbacoochee
Oakfuskee
Hopewell
Bell Mills
Lecta
Bernice
Loffys
Graham
Milner
Swag
Lamar
Sewell
Rockdale
Omaha
Corbin
Talbot
Tenant
West
Leslie
Odelle
Swann
Cooley
Almon
Logan
Viola
Lime
Hickory Flat
Standing Rock
Greenville
Troup
Lagrange
West Point
Shawmut
Langdale
Valley
Riverview
Hamilton
Marion
Perry
Greensboro
Hale
Greene
Pickens
Tuscaloosa
Carroll-ton
Aliceville
Gordo
Reform
Columbus
Starkville
West Point
Oktibbeha
Noxubee
Macon
Winston
Choctaw
Kemper
DeKalb
Electric Mills
Meridian
Lauderdale
Clarke
Wayne
Jones
Smith
Scott
Newton
Leake
Neshoba
Kemper
Lauderdale
Rankin
Hinds
Madison
Yazoo
Holmes
Attala
Leake
Winston
Noxubee
Oktibbeha
Lowndes
Clay
Monroe
Itawamba
Lee
Pontotoc
Union
Alcorn
Tippah
Prentiss
Tishomingo
Corinth
Iuka
Ripley
Boonville
Fulton
Tupelo
Okolona
Aberdeen
Amory
Muldon
Gattman
Columbus
Artesia
Ethelsville
Macon
Shuqualak
Union
Newton
Decatur
Forest
Morton
Carthage
Canton
Jackson
Clinton
Vicksburg
Natchez
Port Gibson
Raymond
Brandon
Pearl
Florence
Jackson
Meridian
Scooba
Enterprise
Quitman
Shubuta
Stonewall
Chunky
Paulding
Hickory
Union
Philadelphia
Louisville
Kosciusko
Carthage
Forest
Morton
Newton
Decatur
Lauderdale
Meridian
Enterprise
Quitman
Waynesboro
Leakesville
Lucedale
George
Greene
Jackson
Pascagoula
Gulfport
Biloxi
Bay St. Louis
Pass Christian
Harrison
Hancock
Stone
Pearl River
Marion
Lamar
Forrest
Perry
Wayne
Jones
Jasper
Clarke
Smith
Scott
Rankin
Simpson
Copiah
Lincoln
Lawrence
Franklin
Adams
Wilkinson
Amite
Pike
Walthall
Marion
Lamar
Forrest
Hattiesburg
Laurel
Purvis
Columbia
Poplarville
Picayune
Wiggins
Gulfport
Biloxi
Pascagoula
Ocean Springs
Moss Point
Escatawpa
Vancleave
Jackson
Harrison
Hancock
Stone
Pearl River
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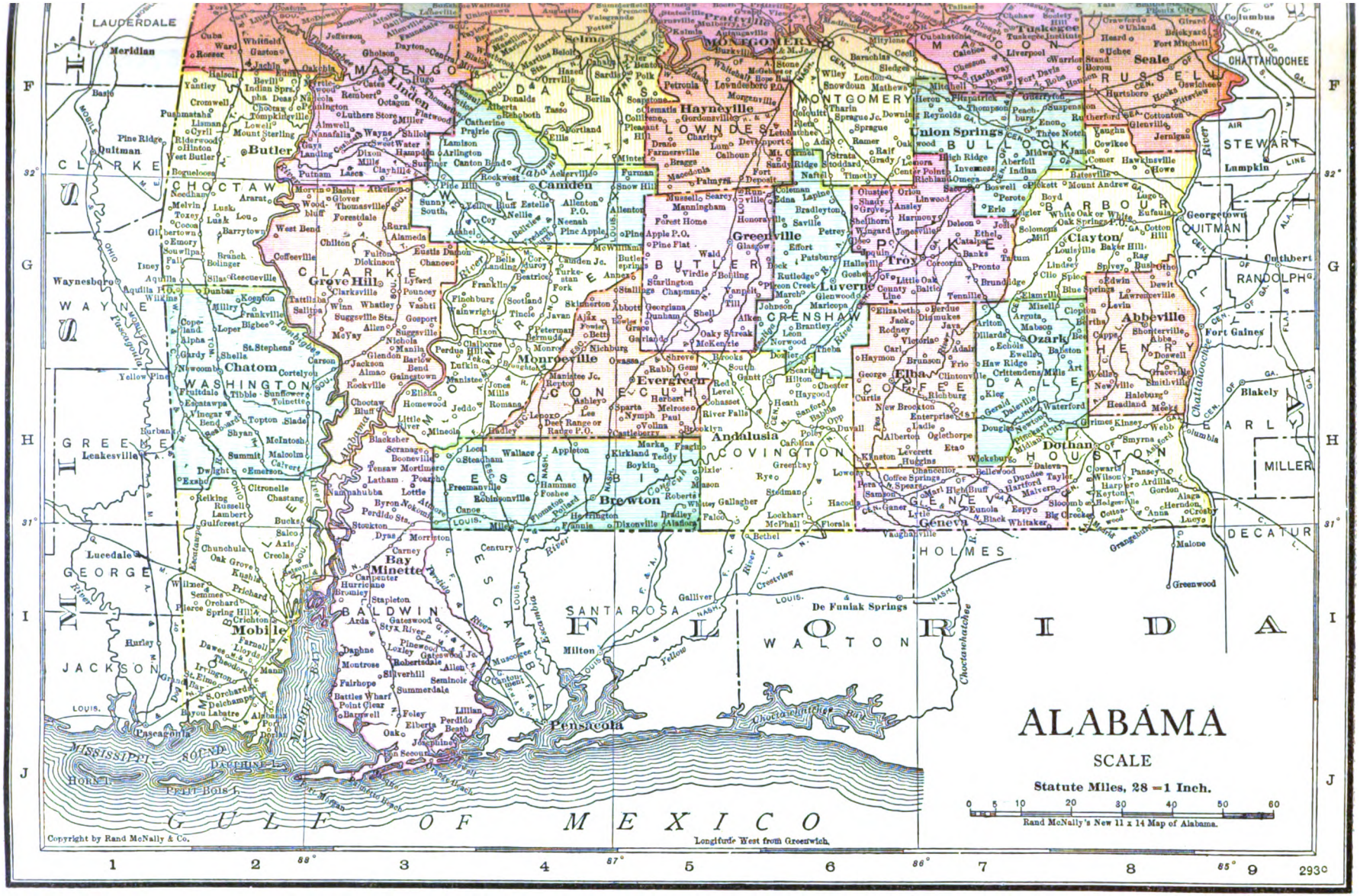
Ocean Springs
Moss Point
Escatawpa
Vancleave
Jackson
Harrison
Hancock
Stone
Pearl River


ALABAMA
SCALE
Statute Miles, 28 =1 Inch.
0 5 10 20 30 40 50 60
Rand McNally's New 11 x 14 Map of Alabama.
Copyright by Rand McNally & Co.
Longitude West from Greenwich.
GULF OF MEXICO
MISSISSIPPI SOUND
MOBILE BAY
FLORIDA
MONTGOMERY
MOBILE
PENSACOLA
Meridian
Selma
Tuskegee
Seale
Union Springs
Greenville
Troy
Clayton
Abbeville
Elba
Andalusia
Opp
Brewton
Evergreen
Monroeville
Camden
Butler
Grove Hill
Chatom
Dothan
Ozark
Fort Gaines
Blakely
Georgetown
Quitman
Eufaula
Clio
Louisville
Luverne
Greenville
Hayneville
Lowndesboro
Tallassee
Columbus
Chattahoochee
Stewart
Lumpkin
Randolph
Clay
Early
Miller
Decatur
Seminole
Baldwin
Escambia
Conecuh
Monroe
Wilcox
Dallas
Perry
Hale
Bibb
Autauga
Elmore
Coosa
Tallapoosa
Lee
Macon
Russell
Barbour
Pike
Crenshaw
Coffee
Houston
Henry
Geneva
Holmes
Walton
Santa Rosa
Escambia
Mobile
Washington
Clarke
Wilcox
Choctaw
Marengo
Sumter
Greene
Pickens
Fayette
Lamar
Marion
Winston
Cullman
Blount
Jefferson
Shelby
Chilton
Coosa
Talladega
Clay
Cleburne
Calhoun
Etowah
Cherokee
DeKalb
Marshall
Jackson
Madison
Limestone
Lauderdale
Colbert
Franklin
Lawrence
Morgan
Cullman
Walker
Fayette
Tuscaloosa
Bibb
Shelby
Jefferson
St. Clair
Blount

of the coal production of the State were first made, and including the 1915 output, Alabama has mined a grand total of 285,475,717 tons of coal — all bituminous. It is known that there are deposits of lignite in the southern part of the State, but no definite survey has yet been made of them.

Coke.— In the production of coke Alabama has ranked second among the coke-producing States for several years. In 1915 the coke industry consumed 4,695,938 tons of coal, valued at $1.48 per ton, and produced 3,071,811 tons of coke valued at $2.78 per ton. The yield of coke was 65.4 per cent of the coal consumed and the value of coal per ton of coke, $2.26. Of the whole coke production, 2,869,268 tons were of furnace quality and 172,991 tons of foundry quality. The entire product was valued at $8,545,555. At the close of 1915 there were 8,568 beehive ovens and 750 by-product ovens in the State, but during the year only 2,506 beehive ovens and 732 by-product ovens had been active. Of the by-product ovens, 450 are of the Koppers type and 300 of the Semet-Solvay type. No reports are available as to the by-products recovered, but it is known that some toluol was produced.

Iron Ore.— The output of iron ore in Alabama in 1915 was 4,374,309 tons of hematite or red ore and 935,045 tons of limonite or brown ore. In the early days of iron-making in the State only the brown ore was used and the furnaces reduced it with charcoal. Later it was discovered that the red ore could be made into good iron at a considerably lower cost, using coke for fuel. The limonites, however, continue to be regarded as the best ores in Alabama and bring a higher price. They make a tougher iron than the red ore and are frequently used with the red ore to improve the quality of the product. The limonite deposits are very numerous and widely distributed over the State, and in some localities are very extensive. The most important occurrences are those overlying the Knox dolomites, the Weisner quartzite, the Lauderdale chert and the Lafayette strata. The brown ore in 1915 brought at the mines $1.68 per ton when the red ore was selling at $1.25 per ton.

All the hematite ore mined in Alabama comes from the Clinton or Red Mountain formation. It is found on both sides of the anticlinal valleys which lie between the coal fields. In spots, owing to faults, the red ore ridges are missing on the western side of the valleys, although in some places and from the same cause the ridges are duplicated on the eastern side. The moderate dips are generally on the eastern side and it is in these locations that nearly all the active mines are found. The hematite seams are exposed in outcrop along a distance of about 50 miles, but for the greater part of this distance they are not rich enough for profitable working. The most important development in the State has been along the easterly side of East Red Mountain, Jefferson County, in the stretch of about 15 miles between the cities of Birmingham and Bessemer. Here there is an almost continuous string of active mines. A new mine, opened in 1915 in Shades Valley, gives promise of being the largest producer in the State. That rank is now held by the Red Mountain mine (a group), which also holds third rank among the iron mines of the United States, with the record for 1915 of 2,138,015 tons of ore, only 170,000 tons behind the leading mine in the country — the Mahoning, of Minnesota. The iron ore of the new mine at Shades Valley analyzes as follows: Metallic iron, 39.5 per cent; calcium carbonate, 24.20 per cent; silica, 9.94 per cent; alumina, 3.34 per cent; magnesium carbonate, 0.78 per cent; phosphorus, 0.32 per cent; metallic manganese, 0.20 per cent.

Pig Iron.— In 1915 there were 27 blast furnaces in operation in Alabama and they produced 2,049,453 tons, about 7 per cent of the 29,916,213 tons which was produced by the whole United States. With this output Alabama took fourth place among the iron-producing States, following Pennsylvania, Ohio and Illinois. The average value for the year was $10.24 per ton. In the latter part of the year the price began to rise and in the early part of 1916 reached $13. Later the price of Southern foundry No. 2 at Birmingham rose to $22 per ton. A general advance in the price of ore followed the rise in iron and the tendency was still upward at the close of 1916.

Clay and Clay Products.— In 1915 there were mined in Alabama 31,520 tons of fire clay, and 250 tons of other clay, which were sold as such in the market. The remainder of the clay mined was manufactured into brick and tile and pottery, and no records were kept as to its amount. The clay products made during the year were valued at $1,193,022, of which $1,177,725 was the value of the brick and tile produced and $15,297 of the pottery. The brick industry centred in Jefferson County, where 68 per cent of the State's entire output was made. A total of 70,681,000 common brick, 29,018,000 vitrified brick, and fire brick to the value of $145,535 was made by 65 operators; and 13 other firms made the red earthenware and the stoneware which constituted the pottery output.

Cement.—Large supplies of the limestone, chalk, clay and shale required for the manufacture of Portland cement exist throughout the State. With coal and labor cheap, the cement industry flourishes. In northern Alabama the limestone used by the cement makers is the hard Trenton limestone, with shale from the Clinton formation or from the coal measures. In central Alabama the soft Cretaceous limestone is used, with the residual clays which overlie it. In southern Alabama the Saint Stephen's limestone is combined with clays from the Grand Gulf formation. In 1915 the cement output of the State was 1,114,386 barrels, valued at $891,183. In North Birmingham is located the principal Puzzolan cement works in the United States; there are but two other such plants in the country. Furnace slag is used in the manufacture of this cement.

Stone.— Alabama has for many years had a thriving industry in stone, principally in limestone. Some very fine building stone of this material has been quarried at Rockwood, in Franklin County. It has proved very durable under weather and wear, and has found an ever-widening market outside of the State. Alabama produces also some notable marbles, both crystalline and non-crystalline. The former, known as statuary marble, occurs as a belt 50 miles long, crossing Coosa and Talladega counties. In quality it compares favorably with the best Vermont marble and many public buildings

have been faced with it. In Shelby County there are deposits of variegated marble, red, pink, black, and white, and at Pratts Ferry on the Cahaba River, in Bibb County, there is another deposit of varicolored marble, ranging from gray through pink, red and brown. A very handsome black marble is also found near Anniston, and at Piedmont in Calhoun County. The total stone production in 1915 was valued at $719,452; of this, $375,000 represented marble. The total includes the value, $289,167, of 523,066 tons of limestone flux, mined for use at the furnaces. Lime was burned in 14 plants in 1915, with a combined output of 60,332 tons, valued at $250,227. Three of the plants produced hydrated lime.

Sand and Gravel.— In 1915 Alabama mined 169,663 tons of molding sand, 157,581 tons of building sand, 6,942 tons of engine sand and 7,294 tons of other sands, and 547,656 tons of gravel. A high grade of glass sand is found in Jefferson and Etowah counties, but no development has yet been made. The value of the sand and gravel production in 1915 was $242,336.

Graphite.— Alabama produces annually about half the crystalline or "flake" graphite mined in the United States, and this production is 47 per cent of all the graphite of all kinds which is mined in the country. The mineral is found in a schist in the form of lenses in a series of metamorphic rocks traversing parts of Clay, Coosa and Chilton counties in the Piedmont region. The average graphite content of this schist is 3 to 4 per cent, but the recovery in milling is rarely more than 2 per cent of the tonnage of ore handled. The industry centres about Ashland, in Clay County, with one or two establishments near Goodwater, in Coosa County, and one near Mountain Creek, in Chilton County. In 1915 only four mines were in operation producing 3,474,800 pounds, valued at $204,572. Three more mines began operations during the year and in 1916 the output of the seven mines was 5,226,940 pounds, valued at $492,407. Two more companies began production in the early part of 1917 and 23 other companies have made preparations to begin mining before the year is out. This marked activity is due to the scarcity of Ceylon graphite in the market because of the shortage in shipping facilities and the high ocean freights. The price of the Ceylon graphite doubled and the demand for domestic graphite became insistent. The larger part of the crystalline graphite produced in the country, and imported, is used by crucible makers, whose business has increased enormously through the manufacture of munitions.

Miscellaneous.— The mineral productions of Alabama which are of minor importance when ranked according to the value of their annual output are gold and silver, mica, millstones, mineral paints (natural), silica, mineral waters, fuller's earth, bauxite, barytes, natural gas and petroleum. In 1915 the value of their combined output was $92,306. There are known to be auriferous lodes in Turkey Heaven Mountain, but they are not being developed. Some new prospecting was done during the year and a new placer was discovered and worked near Heflin. The year's output of gold was $5,243; and of silver, $6. Mica was mined in Randolph, Cleburne, Clay and Tallapoosa counties. The total output amounted to 3,750 pounds of sheet mica and two tons of scrap. It was all consumed locally. Three natural gas wells in Fayette County and two in Walker County supplied a total of 441 customers. Small quantities of petroleum have been found at several localities in the State, the latest and most promising being the new well at Cordova, in Walker County. Oil was struck in this well in December 1916, and it has the record of being the first well in the State to yield enough oil to be measured in barrels. At Hamilton, in Marion County, and at Atwood, in Franklin County, oil-saturated sands have been found and small quantities of oil secured. The strike at Cordova has revived interest in oil exploration in that part of the State. There is one mine near Rock Run, Cherokee County, producing bauxite; one mine in Calhoun County producing barytes; one quarry at Dutton, in Jackson County, producing millstones; and one mine producing ochre, in Clarke County. There are 14 mineral springs in the State producing medicinal waters. The 1915 output reached 86,499 gallons, valued at $8,912.

Forest Products.— Beech, hickory, white oak, yellow, long leaf pine, walnut, ash and elm cover the State in sufficient quantity to be a factor of prime commercial importance. The products from this source include firewood, material for fences, logs, railroad ties, telegraph, telephone and power-conduit poles, materials for barrels, bark and naval stores. The total value of these reaches annually to about $6,500,000, of which about $4,000,000 worth is consumed on the farms and the remainder sold off the lands.

Agriculture.— Alabama is pre-eminently an agricultural State with a wide range of soils admirably adapted to cultivation. The number of farms in 1910 was 262,901, an increase of 17.8 per cent over 1900 when 223,220 farms were reported. The farm area in 1910 was 20,732,312 acres, of which 9,693,581 acres were improved land. The average acreage per farm was 78.9 in 1910 against 92.7 in 1900. The value of all farm property was $370,138,429, including land, buildings and live stock. The average value of land per acre was $10.46 in 1910 against $4.84 in 1900, an increase of 116.1 per cent for the decade. These values have greatly increased (1917) but no statistics are available.

In Alabama, as in other southern States, there is a great tendency to lease farms to tenants or on shares. Of the 262,901 farms in the State in 1910, 158,326 were operated by tenants and 104,575 by the owners. The leasing contracts vary considerably; of the total number in 1910, 83,300 were cash tenants, 2,428 share-cash tenants, and 67,352 were shareholders.

Another matter of great interest in connection with farming in Alabama is the relative amount of land held or leased by whites and negroes. Of the total farm acreage of 20,732,312 acres reported in 1910, 15,640,877 acres were owned or operated by whites, and 5,019,435 by colored farmers. The acreage owned or operated by white farmers decreased during the decade 1900–10 by 324,383 acres, while that owned or operated by negroes increased during the same period by 299,268 acres. By far the great majority of negro farmers are tenants. In 1910 colored owners held 1,466,719 acres, while 3,607,234 acres were

held by colored tenants. Of 103,929 farms owned in 1910, 74,504 were free of incumbrance while 27,457 were under mortgage and the status of 1,908 was unknown. In 1900 80.8 per cent of the farms were free of mortgage while in 1910 only 73.1 per cent were free. Two-fifths of the entire farm area of the State is in farms of from 20 to 49 acres; one-fifth are from 50 to 99 acres, and about one-eighth from 100 to 174 acres. Of the farmers in Alabama in 1910, 152,458, or 58 per cent, were white and 110,443 were non-white, of which number all but 56 were negroes. In 1915 the area under cotton was 3,219,000 acres; the yield was 525,000 bales of cotton valued at $48,956,000. In 1911 Alabama produced 1,716,534 bales of cotton. Due to ravages of the boll weevil cotton is greatly reduced since 1914. Velvet beans and peanuts are replacing its acreage. In 1917 velvet beans were planted on 2,334,000 acres, and peanuts on more than 900,000 acres. The chief crops are maize, 46,688,000 bushels in 1916; wheat, 1,045,000 bushels; oats, 10,500,000 bushels; potatoes, 1,800,000 bushels. Other important crops are hay, 362,000 tons in 1916, and vegetables, peanuts to the value of about $1,500,000 annually; sweet potatoes and yams to the value of $3,500,000; cottonseed valued at $12,000,000 annually; orchard fruits valued at $1,800,000; bush fruits valued at $175,000; tobacco, 60,000 pounds in 1916. Sugar cane is largely grown and manufactured into syrup. In January 1917 the live stock comprised 150,000 horses, 278,000 mules, 405,000 milch cows, 534,000 other cattle, 121,000 sheep and 1,850,000 swine. In 1910 the total value of live stock, including domestic animals, poultry and bees, was $65,595,000. Strong efforts have been made in recent years to diversify the State's agriculture more, and not without success; but the system of renting farms by merchants to small occupiers, largely negroes, who are supplied with necessaries by the merchant on a crop mortgage, makes it difficult to effect the change, as the cotton is a less experimental crop than new ones, and the merchant wishes to sell the occupier other products himself. The partial exhaustion of even the fertile cotton land, however, by continuous planting for many years, has awakened much anxiety for the agricultural future; and the planting of cow-pease, alfalfa, etc., to enrich the soil and feed greater quantities of stock has shown a considerable advance.

Manufactures.— According to the special census of manufactures made by the Federal government for 1914, the figures show that although the number of manufacturing establishments in the State had decreased by 156 since the preceding census (for 1909), the number of the wage-earners had increased in the five years by 6,569; the amount paid in wages had increased by $6,613,000; the capital invested in the State's industries had increased by $54,325,000; and the value of the yearly production of manufactured articles had increased by $32,836,000. Incidentally it may be mentioned that the horsepower employed in the manufacturing industries in the same five-year period had increased by 87,925. The number of establishments engaged in manufacturing in the State in 1914 was 3,242; the number of persons employed was 88,931, of whom 78,717 were wage-earners who received an aggregate of $33,897,000 in wages in the year, an average of $430 each. The combined capital invested amounted to $227,505,432 and the value of the year's output was $178,797,633; of this, $71,386,000 was the value added by the processes of manufacture. The total horsepower employed aggregated 445,762, of which 375,114 was steam and turbine energy, 98,189 electric and 9,621 power from water wheels and water motors.

The principal industries, arranged in the order of the value of their output in 1914, were as follows:

Cotton goods, 57 establishments, employing 13,697 hands, $25,623,000; lumber and timber, 1,335 establishments, 21,646 hands, $21,333,000; iron and steel blast furnaces, 15 establishments, 3,547 hands, $20,066,000; cottonseed oil and cake, 84 establishments, 2,028 hands, $14,982,000; railway car and repair shops, 22, with 7,908 hands, $12,522,000; fertilizers, 80 establishments, 1,416 hands, $10,870,000; coke, 18 establishments, 2,209 hands, $10,353,000; iron pipe, 20 establishments, 3,696 hands, $6,754,000; foundry and machine shops, 79 establishments, 1,866 hands, $4,033,000; printing and publishing, 278 establishments, 1,286 hands, $3,993,000; planing mills, 76, with 886 hands, $2,772,000; flour and grist mills, 73, with 125 hands, $2,179,000; mineral- and soda-water bottlers, 161 establishments, 520 hands, $2,162,000; bread and bakery products, 87 establishments, 651 hands, $2,056,000; turpentine and resin, 160 establishments, 3,411 hands, $2,047,000; brick and tile, 51 establishments, 1,599 hands, $1,622,000; ice manufacture, 55 establishments, 478 hands, $1,201,000; illuminating and heating gas, 14 establishments, 214 hands, $1,125,000. No other industries reached the million mark in their combined output for the year.

The chief manufacturing centre was Birmingham, where 10,863 wage-earners found employment. No other city in the State approached this figure, Mobile ranking next with 2,604.

Of the total number of wage-earners in the State 69,849 were males over 16 years of age and 5,735 were females over 16 years. The number of persons under 16 years engaged in the manufacturing industries of the State was 3,133 — about 4 per cent. Of the whole number of workers, 36,131 had a 60-hour week; 12,797 worked from 60 hours to 72 hours a week; 9,804 worked 54 hours a week; 6,765 worked 48 hours a week; 4,777 worked from 54 to 60 hours a week; 3,507 had a 72-hour week; and 3,372 worked more than 72 hours a week.

Transportation.— The great streams of the State, never closed by ice, afford fully 1,500 miles regular steam navigation, besides smaller boats in reaches; and improvements under way will increase this. The Mobile River and its two great constituents are navigable to Montgomery on the Alabama, 320 miles from the Mobile (the Coosa has also small steamers on it), and to Columbus, Miss., on the Tombigbee, 300 miles. The Chattahoochee is navigable to Columbus, Ga., about 300 miles. Navigation on the Tennessee was hampered by the Mussel Shoals near its western end

in the State, but a canal 23 miles long cut around the shoals has obviated this difficulty. It is navigable to Chattanooga, Tenn., and for small craft as far as Knoxville. The Mobile Basin and Tennessee River Association was organized in 1907 to work for the improvement of Alabama waterways and in 1910 the United States government began extensive improvements in the Alabama and Coosa Rivers to Wetumpka and also in the Warrior and Tombigbee.

Alabama was a leader in the pioneer period of railroad building. As early as 1830 the legislature chartered a two-mile line from Tuscumbia to the Tennessee River and in 1832 another road was chartered which extended to Decatur from Tuscumbia. On both roads were iron bars laid on wooden stringers and the cars were drawn by mules. The stockholders were the cotton planters of the locality who found an ample supply of labor in the plantation negroes. A prosperous commerce developed on the navigable rivers at an early period and in 1858–59 Mobile had become the third exporting port in the United States ('Statistical Abstract,' United States Treasury, Washington 1886).

The railroad mileage increased from 127 miles in 1850 to 6,325 miles in 1916, exclusive of over 300 miles of electric street railroads. The great railroad centre of the State is Birmingham, through which passes nearly every trunk line in the South. The Louisville & Nashville Railroad had an early and potent influence in making available the landlocked mineral resources of the State and the Southern Railroad has been equally active and beneficent in promoting agriculture. The harbor of Mobile, the chief commercial outlet of Alabama and neighboring States, has been greatly improved; the harbor channel is being deepened to 30 feet, making it possible for seagoing ships to be loaded at their wharves. The port is available for the entire commerce of the State, either by rail or river.

Commerce.— The imports at Mobile arrive mostly from Mexico and comprise tropical fruits, chiefly bananas and sisal grass. Total in 1911 was $4,031,737. Raw cotton, the principal export, averages annually over $12,050,000; timber, lumber, etc., $6,800,000; cereals and flour, $2,950,000; lard, $1,800,000; besides cattle, mules, swine and sheep, flax-seed and oil, tobacco, sugar, hops, fruits and nuts. Total export 1911 equaled $30,151,561.

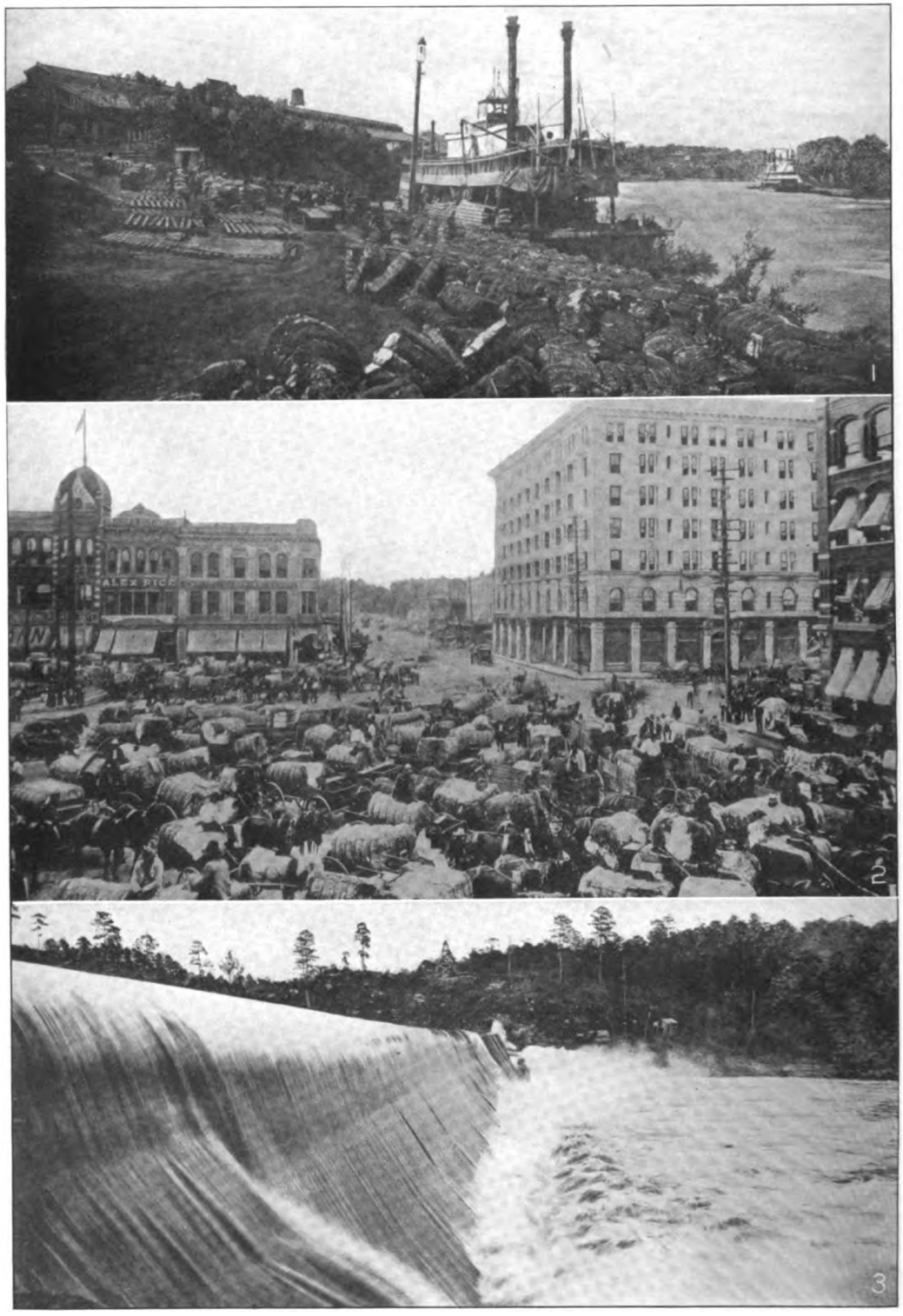
Banks and Finance.— There are in the State 93 national banks with resources of $60,746,000; 205 State banks with resources of $32,189,445; 41 loan and trust companies with resources of $22,534,555; and 11 savings banks with resources of $1,572,282. The capital of the national banks aggregates $9,700,000, and they have annual deposits totaling $35,935,708. In 1915 there were seven banks in Birmingham with deposits of $24,147,379; five banks at Mobile with deposits of $11,724,786; seven banks at Montgomery with deposits of $6,031,383; and five banks at Selma with deposits of $3,763,169. The State now has an officer, the bank examiner, charged with stated and frequent examinations of private banks. Some of the more lately constructed bank buildings are equal in magnificence of appointments to the best in the United States. Alabama, according to the council of the Corporation of Foreign Bondholders, has a defaulted debt estimated at $30,000,000, but the State denies any liability for such estimated indebtedness, having legally adjusted all claims. Unauthorized charges for which no warrants were issued make up the amount claimed. The bonded debt in 1915 amounted to $9,057,000; the assessed value of real property was $389,741,082; of personal property, $236,417,740; total assessed value, $626,150,822. The revenue is derived mostly from taxes on property of all kinds and partly from occupation taxes. The assessment is made at 60 per cent of the cash value for State and county purposes by the county assessors on the sworn statements of the taxpayers. The receipts in 1914–15 (year ended 30 Sept. 1915) amounted, with the previous year's balance of $180,196, to $6,874,734; disbursements amounted to $7,830,045, leaving a deficit of $955,311.

The present State Constitution limits the power of the legislature to levy in any one year a greater rate than 6½ mills on the dollar State taxes. No county may levy a tax exceeding one-half of 1 per cent by State assessment, except for old debts and school purposes. Incorporated cities are subject to same limitation of power of taxation that applies to counties. The State can contract no new debt except that the governor may borrow $300,000. The governor has authority under the State Constitution to extend the present bonded debt of the State. The State bonds of all classes are now above par. Of the State taxes, 30 cents on $100 is applied to the maintenance of the public schools and 25 cents is applied to general purposes, including pensions to indigent Confederate soldiers and widows of Confederate soldiers, salaries, etc. The State revenue is derived as follows: Tax on property and polls, 60 per cent; licenses, 23 per cent; proceeds of convict labor, 18 per cent. About 50 per cent of the disbursements is applied to schools and charitable institutions; 16 per cent to pensions; 10 per cent to penal institutions; about 6 per cent to interest on the bonded debt, and the remainder for miscellaneous subjects, including salaries of chiefs and employees of the State, the judiciary, the National Guard, etc.

Education.— There is a State superintendent of education, an elective office, the term of which is four years. He has general supervision of the public schools and teachers. The public school fund is derived from a State tax of three mills on the $100 assessable values, interest upon the sixteenth section fund and from appropriations by the State legislature together with certain smaller amounts fixed and provided by the legislature. Each county is authorized by a vote of its qualified electors to levy a county school tax of not more than four mills, 40 cents on each $100 of taxable values. The incorporated towns and cities share in all State taxes and in all county taxes. Each of them is also permitted to levy a municipal school tax of not more than three mills, 30 cents on each $100 of taxable values. The total expenditures for the year ending 30 Sept. 1917 from the above sources and including small incidental fees collected amounted to nearly $5,000,000. Each of

STATE CAPITOL AT MONTGOMERY

ALABAMA



1 Loading Cotton Bales on Alabama River Boat 2 Selling Cotton in Court Square, Montgomery, Ala.
3 Tallassee Falls — Electric Power Source

the 67 counties may establish and maintain under the management of the State high school commission a county high school of standard grade to which an additional, annual appropriation of $3,000 is provided by the State. All but about half a dozen counties have availed themselves of this privilege. Ten agricultural high schools, one for each congressional district, are also maintained under State management. Each receives a State appropriation of $5,000 annually. Teachers' institutes are conducted in all the counties each year, under institute conductors appointed by the State superintendent of education. The term of compulsory attendance is 80 days annually, including all children 8 to 15 years, unless they have completed the common school course of seven grades. The State appropriates funds for the Alabama Industrial School for white boys and the Alabama Reform School for juvenile negroes. It aids the Alabama Home of Refuge for white girls and supports the Alabama School for Deaf and Blind. Six normal schools for the training of white teachers are supported and controlled by the State, as well as one normal school for negro teachers. The Alabama Girls' Technical Institute, the Polytechnic Institute (coeducational) and the State University (coeducational) are controlled and managed each by a separate board. Tuskegee Institute for the education and training of negroes, coeducational, is the most extensive educational plant in the State and the largest in the world for negroes. It was founded and developed by the late Booker T. Washington. The State makes an annual appropriation to this school but exercises no control over its policies and management. A majority of its trustees are non-residents of Alabama. The Agricultural and Mechanical College for negroes is supported jointly by State appropriation and national funds. The governing board is self-perpetuating and local. All these State-supported institutions are in a satisfactory condition and are meeting the growing needs of the Commonwealth. In addition to the State schools and colleges there are many flourishing institutions under private or denominational control. Among them should be mentioned the following, either wholly or partly of college grade: Alabama Presbyterian College, Presbyterian (male); Alabama Synodical College, Presbyterian (female); Athens Female College, Methodist; Birmingham College, Methodist (male); Howard College, Baptist (male); Judson College, Baptist (female); Loulie Compton Seminary, private (female); Marion Institute, private (male); Marion Female Seminary, Presbyterian; Saint Bernard College, Catholic (male); Southern University, Methodist (male); Spring Hill College, Catholic (male); Talladega College (colored), Congregational; Woman's College of Alabama, Methodist (female).

Religion.— The Protestant churches, notably the Baptists and Methodists, are in the ascendency in Alabama as throughout all the South. The other religious bodies in order of numerical strength are Roman Catholics, Presbyterians, Christians or Disciples, and Episcopalians.

Charity.— The hospitals, orphanages. homes for the aged and other benevolent institutions, including asylums for the deaf, dumb, blind and insane, number 48. The charitable institutions include insane hospitals at Tuscaloosa and Mount Vernon, the Confederate Soldiers' Home at Mountain Creek, the Industrial School at East Lake, School for the Deaf and Blind at Lineville and a school for the negro deaf and blind. Rules for the support of the poor are made by county commissioners. Within certain degrees, relatives are liable for the support of the poor. For infirm and necessitous Confederate veterans the following annual pensions are allowed according to rating: First-class, $100; second-class, $80; third-class, $64. On 1 Jan. 1910, the number of paupers in almshouses was 739, being 34.6 per 100,000 of population.

Penal.— Although the harsh conditions formerly governing the convict system have been greatly modified, prisoners are still hired out to contractors. Since 1907 special provision is made for dealing with juvenile offenders and in 1911 a State prison inspector was appointed. There is a State cotton mill and cotton farms where women and boy convicts are employed, a penitentiary, a reformatory for wayward women, a reform school for juvenile negro offenders and 20 prisons where State convicts are kept. On 1 Jan. 1910 there were 3,687 prisoners in penal institutions, being 172.4 per 100,000 of the population.

Population, Chief Towns.—From 127,901 in 1820 the population had increased to 996,992 in 1870, to 1,828,697 in 1900, and to 2,138,093 in 1910, the increase being 16.9 per cent in the last decade, or 41.7 inhabitants per square mile as against 35.7 in 1900. Alabama ranks 18th in population among the States. In 1910 the population comprised 625,891 white males, 602,941 white females, 447,794 colored males, 460,488 colored females, 454 Indian males, 455 Indian females and 70 male Asiatics. The foreign-born included 3,599 Germans, 2,348 English, 1,167 Irish, 1,120 Scotch. The capital, Montgomery, has a population of (1915 est.) 42,530; other large cities are: Birmingham, 174,108; Mobile, 56,336; Selma, 13,640; Anniston, 12,794; Bessemer, 10,864, and Gadsden, 10,557. There were 22 cities with a population in excess of 4,000 in 1910. The total State population in 1916 was estimated at 2,332,600.

Constitution.— The Territory of Alabama was organized in 1817 by act of Congress. Population from the Southern Atlantic States from Maryland downward flocked there rapidly. By authority of act of Congress 45 deputies from 23 counties assembled in convention at Huntsville in July 1819, and framed the State Constitution that was accepted and the State was admitted to the Union 14 Dec. 1819. The census of 1820 gave the population, not including any Indians, 127,901. The next census showed 142 per cent increase, of which 18 per cent was slaves and 124 white. No white wage class appeared. Increase of population not Indians fell from 1830 to 1840 to 90 per cent but slaves increased by immigration and natural rule to 115 per cent. The first State Constitution, that of 1819, was made by cotton planters, university men fresh from their forest-opened plantations. It was an aristocratic democracy. The general assembly contained the kernel. The lower branch was elected every year; the higher once in three years. It met every year. The governor was chosen at

the polls every two years. The general assembly elected all courts of record for life. The deputies to the constitutional convention were mostly South Carolinians, North Carolinians, Virginians or Georgians. The Constitution, with certain amendments, endured until by convention an ordinance of secession from the United States made expedient a new Constitution in 1861. The scheme of government was not changed. The original right of emancipation of slaves by individual masters was forbidden. The third State Constitution was framed in 1865 within six months of the collapse of the Southern Confederacy. The President of the United States ordered the convention. The Constitution thus framed revoked the ordinance of secession and emancipated slaves within the borders of the State except for crime convicted. This Constitution went into effect two months prior to the 13th article of amendment of the Federal Constitution emancipating slaves. The electoral vote was given to white males but by special provision it secured to negroes the civil rights possessed by white women and minors. This third Constitution was set aside by the act of Congress in 1867. By that act the army took control of the Southern States, Alabama becoming part of "Military District No. 3," Maj.-Gen. John Pope commanding. General Pope ordered an election to be held during several days in October for the selection of delegates to a constitutional convention. Under this act of Congress the free men were eligible voters. The fourth State Constitution was made under military authority by outsiders, mainly chosen by followers left from the army of occupation, a few citizens and illiterate negroes. In 1875 by State election a fifth Constitution was made. The object was to curtail the power of taxation hitherto held by the general assembly. The military constitution of 1867 had been in force from 1868 to 1875. Under the Constitution of 1875 a debt commission of three made readjustment of the State debt contracted under the military constitution. The debt of about $30,000,000 was reduced to $9,057,000. The debt commission reported that assessable values of the State, which in 1860 exceeded $700,000,000, had been reduced by 1875 to something in excess of $100,000,000. The electorate created by the military constitution was not disturbed by that of 1875. Under that the State government was administered for 33 years. Toward the close of the last century State elections had become impracticable. The belt of white counties were upon the verge of insurrection. The negroes, uneducated, were politically dominant in the black belt, and their votes either purchasable or suppressed at option of partisans. The sixth and last State Constitution was framed by convention in 1901, and ratified at the polls after severe opposition from white leaders and the solid negro sentiment. The only registration list is of date 1908. That presents white electors, 250,381; negro electors, 3,742 ('Official and Statistical Register,' State Dept. Archives and History, 1915, p. 363). The Constitution of 1901 practically eliminates negro suffrage through several of its provisions, such as that requiring an applicant for registration prior to 20 Dec. 1902, to be the descendant of one who took part in the early wars of the nation, the Spanish war or as a member of the Confederacy. Another provision requires that the applicant be able to read and write in English and be physically able to work.

Alabama (1917) has had six State Constitutions, each of conventional product and each the vital essence of the community life at the time. The State was one of the groups in the period, 1812–21, when Congress introduced the sanction of that body to membership in the Union. Vermont, the first new State, that is the 14th State, but in both branches two years before she had established any State Constitution at all, Kentucky came next into Congress by authority of Virginia only. In 1796, the third new State, Tennessee, offered a State Constitution to Congress but in the House it was decided the application should have gone to the Supreme Court only. There the matter was abandoned. Ohio was the fourth, 1802. The State Constitution presented to Congress was referred in the Senate to a special committee that never reported.* The Supreme Court is elected for six years. The State is represented in the Senate of the United States by two senators elected by the people and in the House of Representatives by 10 representatives elected each by the people in a prescribed district. The militia is known as the "National Guard," composed of the three arms of service, infantry, artillery and cavalry, with special corps. There were (1916) about 4,400 enlisted men and officers in camp, well disciplined and equipped. The functions of executive character in the State are, the convict bureau, controlling the penitentiary, under the governor; the department of archives and history, under a director, the governor, ex officio president of the board of trustees, composed of one in each Congress district; State tax commission of three; State board of health; State department of fish and game; State inspector of prisons and cotton mills, three persons; State banking department, seven persons; State highway commission; State geological survey; State board of examiners of public accounts; State coal mine inspector and his associates; State live-stock and sanitary board; State board of Confederate pensions; State board of mediation and arbitration and various other commissions intended to promote the public weal.

Of those enumerated the Alabama public service commission ranks first in importance. It is made up of three citizens elected by the people. It controls railroads, telephone service, telegraphs, etc., and regulates their rates and charges. It has general supervision of firms, corporations and persons engaged in business. Except in the interregnum of military authority, 1867–74, all senators in Congress have been Democrats of the Jacksonian school. Senator Gabriel Moore, Democrat, 1832, having offended the Jackson sentiment, was requested by the legislature, in vain, to resign. In 1840 the legislature abolished the congressional district for a general election in order to eliminate two Whigs from Whig districts. In 1844 the Democratic State Convention recommended Van Buren for President against Calhoun. For Alabama political history preparatory to the founding of the Southern Confederacy, consult Du Bose's 'Life and Times of Yancey.'

* Annals of Congress, Vol. III, p. 50 et seq.

A complete list of governors follows:

TERRITORIAL GOVERNOR

William W. Bibb		1817–19

STATE GOVERNORS

W. W. Bibb	Democrat	1819–20
Thomas Bibb	"	1820–21
Israel Pickens	"	1821–25
John Murphy	"	1825–29
Gabriel Moore	"	1829–31
Samuel B. Moore	"	1831–
John Gayle	"	1831–35
Clement C. Clay	"	1835–37
Hugh McVay	"	1837–
Arthur P. Bagby	"	1837–41
Benjamin Fitzpatrick	"	1841–45
Joshua L. Martin	"	1845–47
Reuben Chapman	"	1847–49
Henry W. Collier	"	1849–53
John A. Winston	"	1853–57
Andrew B. Moore	"	1857–61
John G. Shorter	"	1861–63
Thomas H. Watts	"	1863–65
Lewis E. Parsons	Provisional	1865–
Robert M. Patton	Republican	1865–67
Wager Swayne	(Military Governor)	1867–68
William H. Smith	Republican	1868–70
Robert B. Lindsay	Democrat	1870–72
David P. Lewis	Republican	1872–74
George S. Houston	Democrat	1874–78
Rufus W. Cobb	"	1878–82
Edward O'Neal	"	1882–86
Thomas Seay	"	1886–90
Thomas G. Jones	"	1890–94
William C. Oates	"	1894–96
Joseph F. Johnston	"	1896–1900
William J. Samford	"	1900–01
William D. Jelks	"	1901–07
Braxton B. Comer	"	1907–11
Emmett O'Neal	"	1911–15
Charles Henderson	"	1915–19

Alabamians with national and world-wide reputation won in the succeeding generations under the various political constitutions are: William R. King, senator, Ambassador to France, Vice-President of the United States; Josiah C. Nott, M.D., author of voluminous, illustrated works on "Type of Mankind"; James Marion Sims, M.D., surgeon; William Lowndes Yancey, political orator and leader; Mrs. Augusta Evans Wilson, novelist; John Pelham, a youthful soldier; John Tyler Morgan, senator of the United States.

History.— In 1519, the Spanish governor of Jamaica sent Pineda to explore the gulf coast of Florida. Pineda soon reached a fine body of water, supposedly Mobile Bay, which he called Espiritu Santo. He ascended the broad stream emptying into it for six leagues and saw many houses and natives on the banks. Nine years later, Panfilo de Narvaez, a Spaniard, set out westward from Florida on an exploring expedition. He skirted along the coast, but soon drifted out to sea and he and all but three of his men were lost. In 1539, Ferdinand de Soto, governor of Cuba landed in Florida with a thousand men equipped for fighting their way into the unknown West. The Indians who met De Soto were an interesting type of the American aborigines, and were more numerous than our historians report them in the later time of the white settlements. The men were fairly intelligent, possessed splendid physical forms, were athletic, brave and resourceful. The women were smaller, with marked personal beauty in individuals. These Indians maintained tribal customs that amounted to a form of civil government. They lived in rude log houses and built bins in which to store pumpkins, corn, and dried beef from the forest. They covered their bodies with garments of dressed skins and woven fabrics of bark and grass. At Mauvila, an Indian village near the junction of the Tombigbee and Alabama rivers, De Soto won a hard-fought battle with the Indian chief, Tuscaloosa. After this, De Soto made his way westward to the Mississippi River, and Alabama was undisturbed by the white men for 160 years.

After LaSalle's exploration of the Mississippi River, Alabama was included in French Louisiana. In 1702, a young French-Canadian, Jean Baptiste La Moyne, Sieur de Bienville, founded Mobile. To checkmate the British from South Carolina who sought to monopolize the Indian trade, he built Fort Toulouse near the place where the Tallapoosa and Coosa join; and to protect the colony against the Chickasaws, he built Fort Tombecbe where the Great Southern Railroad now crosses the Tombigbee. The French colony did not succeed. The settlers sickened in their effort to cultivate the soil; so 15 years after Bienville came, the home government chartered the West India Company to settle Louisiana with a vague idea of its boundaries. During 1721, three slave ships brought negroes to Mobile, and African slavery began in Alabama. The colony now took on a new face. Whites, who had been reduced to their last extremity because of labor in the hot climate, now began to trade in timber, tar and turpentine, and to produce from the soil plenteous crops of corn. Cotton was successfully grown, and many decades before Whitney's invention, a crude machine was put in use near Mobile which served to separate the cotton seed from the lint.

Early in the 18th century, the English had planted trading posts north of Mobile, and when the French posts east of the Mississippi were ceded to England, that part of Alabama north of 32° 28″ was added to the Illinois country, and that part south of the line was added to west Florida. Many English and Scotch settled here, and these remained loyal during the Revolution. Spain seized the province of west Florida in 1789. On account of her treaty with England, the United States laid claim to all territory down to 31°. Spain, however, held all south of 32° 28″ until 1798. The land lying between 32° 28″ on the north, 31° on the south, the Chattahoochee River on the east, and the Mississippi River on the west, was organized into Mississippi Territory in 1798. In 1804, land claimed by Georgia and South Carolina, extending to 35°, was added to Mississippi Territory. The Mobile district was taken from Spain in 1812. In 1817, Mississippi Territory was divided. The western half became the State of Mississippi, and the eastern half the Territory of Alabama. On 14 Dec. 1819 Alabama became a State.

At the outbreak of the War of 1812, the chief Tecumseh and his brother, the Prophet, came south to inflame the tribes of Alabama against the whites; and Colonel Nichols came from London to Pensacola with ample freight of arms and ammunition to distribute among the tribes of Alabama as allies of the British army. On 30 Aug. 1813, Chief William Weatherford, one-fourth Indian, three-fourths Scotch, led the Creek warriors to the massacre of Fort Mims. In a few hours, most of the 540 white occupants of this place, men, women and children, were butchered indiscriminately. Only

a few made good their escape. General Andrew Jackson, a fierce avenger, hastened to the field, and on 27 March 1814, he attacked the Creeks in their fortified position on the Tallapoosa, 20 miles north of Montgomery, and almost annihilated the tribe. Near the battlefield on the site of old Fort Toulouse, he built Fort Jackson, assembled the warriors, prophets and deputies of the Creeks and made a treaty with them by which they surrendered most of the tribal lands in Alabama and Mississippi. The British War Office now conceived a plan for operation in the extreme South. Major Lawrence, of the regulars, was placed at Fort Bowyer at the entrance of Mobile Bay with 160 men. The English assailed the fort with perseverance, but were defeated and retreated with loss.

The total white population of Alabama at the beginning of the decade of 1860 was 526,431. The slave population was 435,080. There were 52 counties. In each of the 15 great cotton plantation counties which formed the Black Belt there were from 10,000 to 25,760 slaves, an average of 16,808 slaves and an average of 9,363 white population. The most influential men of the State came from the Black Belt, Mobile and the Tennessee Valley.

Alabama was one of the earliest Southern States to engage in the secession movement, and Montgomery was the first capital of the Confederacy. The Ordinance of Secession was passed 11 Jan. 1861, by a vote of 61 to 39. The division of the vote on the adoption of the Ordinance of Secession was not between a disunion and a union party. The two parties in this convention were the Immediate Secessionists, led by William L. Yancy, and Co-operationists, who believed in the right of secession but hoped in some way through the co-operation of the Southern States to protect their rights without secession. These Co-operationists were led by William R. Smith. When the State seceded, Governor Moore ordered the seizure of Forts Morgan and Gaines which guarded Mobile harbor. The senators and representatives from Alabama resigned their seats in Congress on 21 Jan. 1861. On the 4 February the government of the Confederacy was organized at Montgomery by delegates from the seceding States. Selma was made a leading Confederate arsenal and shipping yard. The Tennessee Valley was occupied by Union forces early in 1862; the fleet in Mobile was destroyed and the forts were retaken by Farragut in 1864; and the whole State was reoccupied April 1865.

A provisional government was established by President Andrew Johnson by the appointment of Lewis E. Parsons, a native of New York, who had long resided in Alabama, to be governor. Governor Parsons ordered an election by the full body of electors, except the several classes not yet pardoned by the President, of delegates to assemble at the Capitol at Montgomery, September 1865. This convention made a new State Constitution revoking the Ordinance of Secession, abolishing slavery and providing for the equality of the freed men in the rights of person and property; but restricted the electorate to the white males eligible. The State government set up by the new Constitution was recognized by the President as soon as the legislature had ratified the 13th Amendment, and went into effect December following. The general assembly of Alabama, however, refused to ratify the 14th Amendment. Thereupon, the senators and representatives from Alabama to Congress were denied seats by that body, and by the Acts of March, 1867, the State government was abolished and military rule restored. Under military supervision, the Constitution of 1868 was made by carpet-baggers, scallawags and negroes and a civil government was set up. The Constitution of 1868 remained in force until 1875. The State was bankrupted by the carpet-bagger régime, and there was great disorder in the attempt to bring the government once more into the hands of the better classes. But these conditions have long since passed away, and the reorganizing of the public debt in 1876 made industrial progress possible. The remarkable industrial changes in the mineral region of Alabama since 1870 have greatly affected the life of the State. To the agricultural life of early days has been added the city life of a mining, manufacturing and commercial people. Great attention has been given to road building. The steel and cotton industries, lumbering and mining have developed enormously and agriculture is now improving rapidly.

During the Spanish-American War, Alabama furnished two white regiments and one negro regiment. President McKinley overcame what was left of sectional ill-feeling by appointing Joseph Wheeler, a representative in Congress from Alabama and an ex-Confederate general, major-general of volunteers, and giving him command of all the cavalry at the battle of Santiago de Cuba. In the last decade the burning question in Alabama has been prohibition. After wavering between local option and State-wide prohibition, the State adopted State-wide prohibition in 1915. The State has always been Democratic, except during the carpet-bagger régime.

The construction of the Panama Canal has greatly enhanced the importance of Mobile as a port. Since the United States' declaration of war against Germany, Mobile has been selected as a centre of important naval construction work. The Tennessee valley in the extreme northern part of the State is one of most prosperous sections of Alabama. In 1915, the United States government appropriated $20,000,000 for the purpose of manufacturing nitrate. An experimental nitrate plant has been located at Sheffield, and a permanent plant is being constructed near South Florence, at Mussel Shoals post office, established February 1918. In addition, a great dam across the Tennessee River at Florence for the purpose of developing the enormous power of the Mussel Shoals is to be built by the government. So great will be the power developed that Florence, Sheffield, and Tuscumbia will become important industrial centres.

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HENRY J. WILLINGHAM,
President State Normal School, Florence, Ala.

ALABAMA CITY, Ala., town in Etowah County, 56 miles north of Birmingham on the Louisville and Nashville, the Alabama Great Southern, the Nashville, Chattanooga and Saint Louis and the Southern railroads. Large steel works and a cotton mill form the industrial resources of the city. Coal is found in the vicinity and corn, oats, cotton and wheat are raised extensively in the surrounding country. Pop. 4,313.

ALABAMA POLYTECHNIC INSTITUTE, at first known as the Alabama State Agricultural and Mechanical College. This institution is a college at Auburn, Ala., organized in 1872, under the Federal Land Grant Act of 1862. The value of its grounds, buildings and general equipment is estimated to be about $476,000. It has a campus and forum of 304 acres. The library contains 25,000 volumes, and the students number more than 800 in the various courses.

ALABAMA RIVER. An important river of the State of Alabama. Formed by the union of the Tallapoosa and Coosa rivers, about 10 miles direct northeast of Montgomery, it winds with a navigable course of 320 miles first west to Selma, then south, until about 50 miles above Mobile, it joins with the Tombigbee to form the Mobile River. On its banks are valuable timber, some of the largest southern cotton plantations and the towns of Montgomery, Selma, Cahawba and Claiborne, which carry on an active river transit trade.

ALABAN'DITE, an iron-black, submetallic mineral. It is usually granular-massive, while its rare isometric crystals exhibit very perfect cubical cleavage. The black color of a fresh surface tarnishes to a dark brown, while its streak is green. Its hardness is 3.5 to 4 and specific gravity about 4.0. Alabandite is a manganese monosulphide MnS, and contains 63.1 per cent of manganese. Some of its most important localities are in Austria-Hungary, Peru and Mexico. It also occurs in Summit County, Cal., and at Tombstone, Ariz.

ALABASTER, a name applied to two substances, the one a stalagmitic or stalactitic carbonate of lime, the other a kind of gypsum or sulphate of lime. The first is often called Oriental alabaster, and is that which is mentioned in the New Testament. It occurs in caves in limestone regions and is a translucent stone of yellowish milky color or of a deeper tinge of yellow and sometimes marked with lighter and darker streaks like an onyx. It is found in the cave of Antiparos, the Baumann's cave in the Hartz and is now worked in the province of Oran in Algeria. The gypseous alabaster has a fine granular texture and is usually of a pure white color. It is softer than the other alabaster, indeed so soft that it may be scooped out with the nails; while the other kind cannot be so treated. It is found in many parts of Europe; in great abundance and of peculiarly excellent quality in Tuscany and Piedmont in Italy, also in England. It is extensively carved into statuettes and vases and often sold as "Florentine marble." Many museums contain ancient vases and similar articles of alabaster, for which the Romans often employed this material.

ALACOQUE, ą'lą'kōk', **Marguerite Marie** ("the Blessed"), a French nun: b. 1647; d. 1690; to whom, according to Catholic faith, was revealed through visions of Christ, the commands to confirm devotion to the Sacred Heart of Jesus. Private devotions had long existed and an office and festival had previously been instituted by Father Jean Eudes (1601–80). Her treatise, 'La devotion au coeur de Jesus,' describing her visions and transcribed by Father de la Colombière of the Jesuit monastery at Paray-le-Monial, was published at Lyons in 1684. Thereafter the observance spread with great rapidity, but not until 1856 was the feast under the rite of double major extended to the universal Church by Pope Pius IX, who had previously beatified her memory in 1846.

ALADDIN, or **THE WONDERFUL LAMP,** one of the stories in 'The Arabian Nights' Entertainments.' Aladdin, the son of a poor widow, comes into possession of a magic ring and lamp, and thus becomes the master of the powerful jinns who are the slaves of the lamp and ring. Through their powers he amasses great wealth and becomes sultan.

ALAGOAS, ä'la-gō'ąsh, Brazil, a maritime province, deriving its name from various intercommunicating lakes for which it is noted; capital Maceio. It is bounded on the north and west by the province of Pernambuco, on the south by that of Sergipe del Rey and on the east by the Atlantic; area, 11,640 square miles. This province has several lakes, none of them of great extent, frequented by a great variety of birds; and in the west several ridges of hills, none of them of great elevation, but generally well wooded, and inhabited by abundance of game, ounces, macaws, etc. From the extent of surface covered by lakes and by forests the climate of Alagoas is on the whole moist. The plains near the sea are generally sandy and not very fertile; but inland the soil is good, producing besides tobacco, cotton and sugar, which are exported to Bahia and Pernambuco, rice, cocoanuts, mangoes, oranges, jack-fruit and abundance of fine timber used for ship-building in the above-named ports and in Maceio. The forests furnish excellent building and dye woods and much ipecacuanha. Limestone, granite and various kinds of clay abound in the province. Pop. 790,000.

ALAIS, ä'lā, France, town of the department of Gard, situated in a fertile plain on the right bank of the Garden at the base of the Cevennes Mountains, 23 miles by rail northwest of Nimes. Alais is a very flourishing community, owing much of its prosperity to the abundance of mineral wealth of the district surrounding it which produces coal, iron, lead, zinc and manganese. Blast furnaces, mines and factories of various kinds give employment to large numbers of men, and Gard may therefore be justly styled the Black Country of France. There is also an extensive trade in silk, glass, bricks and tiles. There are in Alais monuments to Florian the novelist, and to Pasterer, who became famous after his studies of the silk worm disease then prevalent in Alais. The town sided with the Protestants in the religious wars of the 17th century and Louis XIII in person, accompanied by Cardinal de Richelieu, besieged it and, having captured it in 1629, demolished its walls. Three years later the Baron of Alais having taken part in the rebellion of Montmorency, the castle was destroyed. Protestantism still prevails to a considerable extent. Consult 'Mémoirs et Comptes-rendus de la Société Scientifique et Littéraire d' Alais.' Pop. 1901, 24,940; 1911, 29,831.

ALAIS, Peace of, a treaty which closed the Huguenot wars in France. It was signed 28 June 1629, immediately after the capture of Alais by the royal forces, La Rochelle having fallen as a result of Richelieu's policy the year before. In accordance with its terms the fortifications of the Protestant towns were razed and Catholic worship re-established in them, but amnesty and freedom of conscience were granted to the rebels.

ALAJUELA, äl-ä-whā'la, city of the state of Costa Rica, Central America, 23 miles west northwest of Cartago, and a little on the western side of the watershed between the Atlantic and the Pacific. It is connected with Cartago by rail and carries on a considerable trade in cattle, coffee, sugar and bananas. Pop. 6,300.

ALAMAN, ä-lä-män', **Lucas,** Mexican historian and statesman: b. 18 Oct. 1792; d. 2 June 1853. He was educated in Spain 1814–20, and served as minister of foreign affairs, 1823–25, 1830, 1837, 1853. He introduced European machinery; founded a museum of antiquities and natural history, and was an active official encourager of industry and agriculture, but reactionary in religion and politics. His works are 'Dissertations on the History of the Mexican Republic from the Conquest to Its Independence' (3 vols., Mexico 1844–49), an introduction to his 'History of Mexico,' 1808–30 (5 vols., Mexico 1849–52), of scholarly impartiality in the main, filled with documentary proofs, but with a tendency to belittle the actions of those not of pure Spanish blood.

ALAMANCE CREEK, N. C., Battle of, 16 May 1771, sometimes termed the first battle of the American Revolution. Official corruption and burdensome taxation in North Carolina roused public resentment so that the colonists banded themselves into "Regulators" to reform conditions. The rough element resorted to riot and violence, whereupon the assembly passed the Johnson bill (better known as the Bloody Act), which made rioting treason. Governor William Tryon (q.v.) collected 1,200 militia and on 16 May 1771, at Alamance Creek, near Hillsboro, encountered and defeated about 2,000 Regulators (of whom only about 1,000 were armed), inflicting a loss stated at from 9 to 200, while his own loss was about 60 or 70. Twelve Regulators were tried for treason and condemned, but only six were executed. The others submitted and ultimately nearly 6,500 took an oath of allegiance to the royal government. Consult J. S. Bassett's article in 'Report of the American Historical Association' for 1894, pp. 141–212; Fitch, William E., 'Some Neglected History of North Carolina'; 'North Carolina Colonial Records' (Vols. VII–IX); Haywood, Marshall de L., 'Governor Tryon and His Administration'; Stockard, 'History of Alamance'; Husband, Harmon, 'Affairs of North Carolina'; 'The South in the Building of the Nation' (Vol. I, pp. 452–456).

ALAMANNI, ä'la-män'nē, or **ALEMANNI,** a confederacy of several German tribes which, at the commencement of the 3d century after Christ, lived near the Roman territory, and came then and subsequently into conflict with the imperial troops. Caracalla first fought with them in 211, but did not conquer them; Severus was likewise unsuccessful. About 250 they began to cross the Rhine westward, and in 255 they overran Gaul along with the Franks. In 259 a body of them was defeated in Italy at Milan, and in the following year they were driven out of Gaul by Postumus. But the Alemanni did not desist from their incursions, notwithstanding the numerous defeats they suffered at the hands of the Roman troops. In the 4th century they crossed the Rhine and ravaged Gaul, but were severely defeated by the Emperor Julian and driven back. Subsequently they occupied a considerable territory on both sides of the Rhine; but at last Clovis broke their power in 496 and deprived them of a large portion of their possessions. Part of their territory was latterly formed into a duchy called Alemannia or Swabia, this name being derived from Suevi or Swabians, the name which they gave themselves. It is from the Alemanni that the French have derived their names for Germans and Germany in general, namely, *Allemands* and *Allemagne,* though strictly speaking only the modern Swabians and northern Swiss are the proper descendants of that ancient race.

ALAMANNI, Luigi, Italian poet: b. Florence 1495; d. 1556. His father was zealously devoted to the party of the Medici, and he himself stood in high favor with the Cardinal Giulio, who governed in the name of Pope Leo X; but conceiving himself to have been injured he joined a conspiracy formed against the life of the cardinal. The plan was discovered; Alamanni fled to Venice; and when the cardinal ascended the papal chair, under the name of Clement VII, he took refuge in France. But the misfortunes which befell this Pope giving Florence an opportunity to become free, Alamanni returned thither in 1527. His country sent him on an embassy to Genoa. Here he became the friend of Andrea Doria with whose fleet he went to Spain. Charles V soon after sailed in the same fleet from Spain to Italy to arrange the affairs of Florence and subject it to the Medici. After this new revolution, Ala-

manni, now proscribed by the Duke Alessandro, went to France (1530) where the favors of Francis I retained him. Here he composed the greater part of his works. The King esteemed him so highly that after the peace of Crespy in 1544 he sent him as ambassador to the Emperor Charles V. Alamanni discharged his office with great skill. He was held in like estimation by Henry II, who also employed him in several negotiations. He followed the court and was with it at Amboise, where he died in 1556. His principal works are 'Opere Toscane,' 'La Coltivazione,' 'Girone il Cortese,' etc. The English poet Wyatt imitated some of his satirical work. The writings of Alamanni are recommended by ease, perspicuity and purity of style, but often want strength and poetic elevation.

ALAMEDA, ă-lă-mā'dą, Cal., a coextensive city and township in Alameda County, on San Francisco Bay and the Southern Pacific, Santa Fe and the Western railroads, 11 miles east southeast of San Francisco. It is the seat of the College of Notre Dame (Roman Catholic); a popular summer resort, and the place of residence of many San Francisco business men. It has numerous banks, electric lighting and street railways, large borax works, extensive potteries, oil refineries, ship-building yards, engine, motor, pump, moving picture and aeroplane manufacturing plants. According to the United States census 1914, there were in that year 53 manufacturing establishments of factory grade, employing 1,267 persons, of whom 1,092 were wage earners receiving an aggregate of $1,029,000 in wages. The total capital employed was $3,737,000, and the value of the output was $2,794,000, of which $1,789,000 was the value added by manufacture. The commission form of government was adopted in 1913. Alameda grew from a population of 100 in 1854 to 23,383 in 1910; (1916) 26,500.

ALAMINOS, ă-lă-mē'nōs, **Antonio de,** Spanish pilot: b. in Palos, Spain, about the end of the 15th century. He is said to have been with Columbus in 1599, and was the principal pilot for the expeditions of Cordova, Ponce de Leon and others in the early part of the 16th century. The earliest map of North America is supposed to have been prepared by Alaminos.

ALAMO, ă'lă-mō, **The,** San Antonio, Tex.; a Franciscan mission house built about 1722 and called San Antonio de Valerio; after 1793 used on occasion as a fort and renamed Fort Alamo. It consisted of an oblong plaza some 2½ acres in area, enclosed by walls 8 feet high and 33 inches thick, a church, a hospital building, a convent and a walled convent yard about 100 feet square. It has enduring celebrity as the scene of the battle and massacre of 6 March 1836, in the war for Texan independence. The fort was held by about 140 men under William B. Travis, and on 23 February was invested by a considerable Mexican army (probably about 4,000) under Santa Anna, who at once began a bombardment scarcely intermitted for the next 10 days. The little garrison, compelled to man the defenses day and night, and too few to relieve each other, sent desperate appeals to their outside comrades for help; but to break through the dense Mexican forces was so difficult that the only reinforcement received was 32 men on the 1st of March. At last a breach was made in the walls, and shortly after daylight on the 6th a general assault was ordered. Twice the storming party were repulsed with heavy loss of lives; the third time they gained the parapet and entered the enclosure. No surrender was offered, and the result showed that the Texans knew their foe too well to expect quarter; worn with fatigue and privation, they fought to a finish, till only five were left. These were taken prisoners, and the savage Santa Anna had them slaughtered on the spot. Three women, two white children and a negro boy were the sole survivors of about 180 inmates. Santa Anna stated the Mexican loss at 70 killed and 300 wounded, but it is believed to have been much greater. The news of the heroic fight, "The Thermopylæ of America," nerved the Texans in all their future efforts, and their slogan was "Remember the Alamo!" Santa Anna himself was defeated and captured at San Jacinto a few weeks later. Consult Corners, 'San Antonio de Bexar' (1890); Williams, 'Sam Houston and the War of Independence' (1893); Ford, J. L., 'Origin and Fall of the Alamo' (1896).

ALAMOSA, Col., city and county-seat of Conejos County, 110 miles south of Pueblo, on the Rio Grande, and on the Denver and Rio Grande Railroad. It has a Carnegie library and an opera house. Its industrial establishments comprise a flouring mill and railroad repair shops. The surrounding region is a prosperous agricultural and stock raising section, in the products of which the city has a large trade. The city owns the waterworks and sewage system. Pop. 3,013.

ALAND ISLANDS, ă'ląn, a group of about 80 islands and islets between the Gulf of Bothnia and the Baltic Sea, and near the mouth of the Gulf of Finland; area, 468 square miles. The principal islands are Aland, which is the largest and gives name to the group; Lemland, Lumparland, Ekeroe, Fogloe, Kumlinge, Braendoe, Vordoe and Hannoe. Aland, distant about 30 miles from the Swedish coast, is 25 miles long and about 22 broad. In this island is a harbor capable of containing the whole Russian fleet. The chief towns are Aland and Castelholm. The islands are now included in the province of Finland. When the European War broke out in 1914 the islands were not fortified. Their strategic importance was beyond question, as properly fortified, they form virtually an impassible barrier between the Baltic and the Gulf of Bothnia and provide a naval base commanding the entrance to the Gulf of Finland. According to the North Sea Baltic Treaty of 1908 they were not to be fortified or used for military or naval purposes. Through the intermediary of Great Britain and France, apprehensions of the Swedish government were removed, Russia readily giving definite assurances that any defenses would be purely for war emergencies, and that any such military works would be removed at the conclusion of peace. Pop. about 19,000.

ALANI, or **ALANS,** one of the warlike tribes which migrated from Asia westward at the time of the decline of the Roman empire. They are first met with in the region east of Mount Caucasus, where Pompey fought with them. From this centre they spread over the south of modern Russia to the confines of the

Roman empire. They were engaged in war with Rome in the time of Hadrian, but were defeated by Arrian, the general of that Emperor. Marcus Aurelius had much difficulty in keeping them out of the empire, and Tacitus concluded a treaty with them (275 A.D.). About a century later those on the banks of the lower Danube were conquered by the Huns, after which most of them joined the ravaging expeditions of that people. They accompanied Rhadagais on his march into Italy, and after his defeat they settled first on the Rhine, afterward (about 411) in modern Portugal. Being there completely defeated by the Visigoths, they joined the Vandals, among whom they have become lost to history.

ALANUS AB INSULIS, a-lā'nus ab in'sū-lis, or **ALAIN DE LILLE,** ā-lan de lēl, a French scholastic philosopher: b. 1114; d. 1203. Of his voluminous theological writings the best known is the treatise on "The Articles of the Faith." His poem, "Anti-Claudinus, or On the Duties of a Good and Perfect Man," is one of the most celebrated poetic compositions of the Middle Ages.

ALARCON, Pedro Antonio de, Spanish novelist, poet and politician: b. Gaudix, 10 March 1833; d. 19 July 1891. His critical contributions to papers, political and literary, his description of the Moroccan campaign, but especially his novels and short stories, are among the best of their kind and present a picture of modern Spanish society as true to life as it is variegated. His clever essay, 'The Poet's Christmas,' went through over 100 editions. An imposing number of his stories appeared under the collective titles 'Love and Friendship,' 'National Tales,' 'Improbable Stories.' Among them 'The Three-Cornered Hat' and 'The Scandal' deserve special mention. See EL SOMBRERO DE TRES PICOS (The Three-Cornered Hat).

ALARCON Y MENDOZA, ä-lär-kōn ē mān-dō'-thä, **Don Juan Ruiz de,** Spanish dramatist: b. Tasco, Mexico, about 1588 or 1590; d. 4 Aug. 1639. Little is known about his early life, but he went to Spain in 1600 and became royal attorney in Seville. From 1608 to 1611 he was in Mexico; then he took up his residence in Madrid, where he was appointed reporter of the royal council of the Indies, about 1628. Elevated sentiment, harmony of verse and correctness of language distinguish his works, the principal of which are 'The Weaver of Segovia'; 'Suspicious Truth,' the model for Corneille's 'Liar'; 'Walls Have Ears'; 'The Proof of Promises'; 'The Anti-Christ.' A complete edition of his works was published by Hartzenbusch in Madrid 1866.

ALARIC I, King of the Visigoths: b. about the middle of the 4th century; d. 410, and is first mentioned in history in 394 A.D., when Theodosius the Great gave him the command of his Gothic auxiliaries. The dissensions between Arcadius and Honorius, the sons of Theodosius, inspired Alaric with the intention of attacking the Roman empire. In 396 he ravaged Greece, from which he was driven by the Roman general Stilicho, but made a masterly retreat to Illyria, of which Arcadius, frightened at his successes, appointed him governor. In 400 he invaded Italy, but was defeated by Stilicho at Pollentia (403), and induced to transfer his services from Arcadius to Honorius on condition of receiving 4,000 pounds of gold. Honorius having failed to fulfil this condition, Alaric made a second invasion of Italy, during which he besieged Rome thrice. The first time (408) the city was saved by paying a heavy ransom; the second (409) it capitulated, and Honorius was deposed, but shortly afterward restored. His sanction of a treacherous attack on the forces of Alaric brought about the third siege, and the city was taken, 24 Aug. 410, and sacked for six days. He quitted Rome with the intention of reducing Sicily and Africa, but died at Cosenza.

ALARIC II, King of the Visigoths from 484 to 507 A.D. At the beginning of his reign the dominions of the Visigoths were at their greatest extent, embracing three-fourths of the modern Spain and all western Gaul to the south of the Loire. His unwarlike character induced Clovis, King of the Franks, to invade the kingdom of the Visigoths. In a battle near Poictiers (507) Alaric was slain and his army completely defeated. The 'Breviarium Alaricianum,' a code of laws derived exclusively from Roman sources, was compiled by a body of Roman jurists at the command of this King Alaric.

ALA-SHEHR, a-la-shär', ancient Philadelphia, a town in Turkey in Asia, 76 miles east of Smyrna, famous as the seat of one of the first Christian churches, and still having a vast number of interesting remains of antiquity, consisting of fragments of beautiful columns, sarcophagi, fountains, etc. It is a place of some importance, carrying on a thriving trade, chiefly with Smyrna, to which runs a railway. Pop. 20,000.

ALASKA. The greatest of the Territories of the United States in area and in prospective resources. It practically is divided into three distinctive regions — the main territory, the panhandle or southeastern Alaska, and the Aleutian Archipelago. The main territory includes all that part of the continent of North America to the west of the 141st meridian of west longitude; its other boundaries are the Arctic Ocean to the north, Bering Sea to the west and the Pacific Ocean to the south. The panhandle of southeastern Alaska comprises a narrow fringe of continental coast — with the outlying and adjacent islands — extending from Portland Canal north to Mount St. Elias. The Aleutian Archipelago consists of all the islands westward from the Alaskan Peninsula to include Attu, off the Asiatic coast. Under American jurisdiction also are the islands of Bering Sea — the Pribilofs, Saint Lawrence and others near the Alaskan mainland. The geographical extension of Alaska is very great, from 51° N. in the Aleutian Archipelago to about 72° N. latitude at Point Barrow, and from 130° W. longitude, in Portland Canal, westward to Attu Island in 173° E. longitude.

Physiography.— Since Alaska, with its area of about 590,000 square miles, is one-third greater in size than the Atlantic States from Maine to Florida, its detailed geographic description would involve much space. Sitkan Alaska, the land of tourists, is a narrow region intersected by long, deep fiords, which are dom-

ALASKA

Estimated population, 64,834

TOWNS

Pop.		
318	Afognak	F 6
151	Anvik	D 4
446	Barrow	A 5
337	Cape Prince of Wales	C 2
185	Chena	D 7
566	Chignik	G 5
....	Chomly	
144	Circle	C 8
1,152	Cordova	
289	Council	C 3
....	Dolomi	G 12
1,722	Douglas	F 11
261	Dyea	E 11
178	Eagle	C 9
98	Ellamar	E 7
321	Fort Yukon	C 8
3,541	Fairbanks	C 7
221	Gambell	
158	Golovin	C 4
445	Haines	E 11
462	Hoonah	F 11
200	Howkan	G 12
1,644	Juneau	E 12
232	Kake	
549	Kariuk	
129	Kasaan	
250	Kenai	E 6
1,613	Ketchikan	F 12
351	Killisnoo	
241	Klawock	F 12
245	Klukwan	
438	Kodiah	F 6
231	Koserefsky	D 4
168	Loring	F 12
602	Metlakatla	F 12
2,600	Nome	C 2
230	Nulato	
74	Nushagak	E 4
585	Petersburg	F 12
243	Point Hope	
119	Rampart	C 7
6	Sand Point	G 3
173	Seldovia	E 6
534	Seward	E 6
118	Shakan	F 12
1,039	Sitka	F 11
872	Skagway	E 11
415	St. Michael	D 3
137	Sumdum	
130	Sunrise	E 7
233	Susitna	
398	Tanana	C 6
1,222	Treadwell	F 12
2	Udakta	
247	Unalakleet	D 4
281	Unalaska	G 1
108	Unga	G 3
810	Valdez	E 7
743	Wrangell	F 12
271	Yakutat	E 10

ARCTIC
ASIA
BERING STRAIT
BERING SEA
BRISTOL BAY
ALEUTIAN ISLANDS
SEWARD PENINSULA
NORTON SOUND
ST. LAWRENCE I.
NUNIVAK I.
ST. MATTHEW I.
HALL I.
ST. PAUL I.
PRIBILOF ISLANDS
ST. GEORGE I.
ARCTIC CIRCLE
BAIRD MOUNTAINS
BROOKS RANGE
ALASKA RANGE
Barrow
Franklin Pt.
Pearl Bay
Cape Collie
Icy Cape
Pt. Lay
C. Beaufort
C. Lisburne
Cape Lewis
Cape Dyer
Pt. Hope
C. Thompson
C. Seppings
Cape Serdze
C. Krusenstern
Kotzebue
Kotzebue Sound
C. Blossom
C. Espenberg
Good Hope Bay
Deering
Keewalik
Candle
Taylor
York
Tin City
Pt. Spencer
Indian Pt.
Teller
C. Douglas
Pt. Woolley
C. Rodney
Nome
Cape Nome
Bluff
Rocky Pt.
C. Denbigh
Norton Bay
C. Chibukak
N. Cape
C. Kukulliak
West Cape
S.W. Cape
Dickson or Solomon P.O.
C. Chitnak
N.E. Cape
East Cape
S.E. Cape
Pt. Romanof
St. Michael
Stuart I.
Pastolik
Kotlik
Anemuk
Scammon Bay
C. Romanzof
Andreafski
Anvik
Yukon
Fortuna Ledge
Pt. Dall
Hooper Bay
Kashunuk R.
Azun R.
Pt. Upright
Hazen Bay
C. Etolin
C. Mohican
Cape Mendenhall
Baird Inlet
Nelson I.
Bethel
Kinak
Kwakokleum
Okavigamut
Ohagamut
Chukhak River
Kapoimut
Holy Cross
Pymute
Russian Mission
Georgetown
Iditarod
Innoko
Ophir
Inmasale
Unalakleet
Shaklolik
Egowik
Eaton
Kaltag
Loudeen
Melozi
Long
Poorman
Dishkakat
Cripple
Lake Minchumina
Kohrines
Telegraph
Military
Yulatat
Tolstoi Pt.
Wireless Tel.
Kaiyuh R.
Iditarod R.
Innoko R.
Yukon R.
Koyukuk R.
Tanana R.
Kuskokwim R.
Kuskokwim Bay
Cape Avinot
Kipnuk
Quinhagak
Kanektok R.
Tikchik Lake
Goodnews Bay
Portage Bay
C. Peirce
HAGEMEISTER I.
Dillingham
Nushagak
Etolin Pt.
Protection Pt.
C. Constantine
C. Chichagof
Naknek Lake
Becharof L.
Iliamna Lake
Kvichak R.
Nushagak R.
Wood R.
Togiak Bay
Togiak R.
Kulukak Bay
Kagati
Port Heiden
C. Greig
C. Menshikof
Port Moller
Pacific Ocean
Izanotski Strait
C. Lapin
C. Sarichef
Unimak Pass
Unimak I.
Unimak Bay
C. Lazaref
Unalaska
UNALASKA I.
Ikutan Bay
C. Pankof
SANNAK IS.
Apollo Point
Ungalaska Bay
Chignik
Foggy Cape
TUGIDAK I.
TRINITY IS.
SEMIDI IS.
CHIRIKOF I.
Aniakchak Bay
Aliak Bay
C. Providence
Ikolik Cape
Kialagvik Bay
Dyak
KODIAK I.
Sitkalidak Strait
SITKALIDAK I.
Ugak Bay
Narrow Cape
C. Greveville
Chiniak Bay
Kodiak
Afognak
Marmot I.
Tonki Cape
SHUYAK I.
Shuyak Strait
Kachemak Bay
Seldovia
Augustine I.
Barren Is.
C. Douglas
Tyonek
Susitna
Cook Inlet
Kenai
Clark Lake
Skilak L.
Chuitna R.
Tikchik R.
Kanektok R.
Kvichak R.
Nushagak R.
Mulgrave Hills
Noatak
Noatak River
Chandler Lake
Colville
Chipp River
Meade River
Ikpikpuk R.
Killik R.
Chandler R.
Anaktuvuk R.
Wild R.
Alatna R.
Koyukuk R.
Hotham Peak
Selawik R.
Buckland R.
Kobuk R.
Candle
Bettles
Bettles R.
Bergman
Old Man R.
Melozitna R.
Chatanika R.
Baker
Glacier
Chatlotthna R.
Tonzona R.
Kuskokwim R.
Mt. Foraker
Mt. McKinley
Susitna R.
Talkeetna
Tyonek
Kenai
Skilak L.
Chuitna R.
Lake Clark

BERING SEA
ALEUTIAN ISLANDS
PACIFIC OCEAN
ROCKY MOUNTAINS
CANADA
DOMINION OF
YUKON
KLONDIKE
REGION
Dawson
Fort Selkirk
White Horse
Mt. Goodenough
Mt. Dewdney
Mt. Klotz
Mt. King
Mt. Allen
Mt. Natazhat
Mt. Walsh
Mt. Logan
Mt. Hubbard
Mt. St. Elias
Mt. Cook
Lake Kluane
L. Aishihik
L. Laberge
Kusawa Lake
Mt. Wrangell
Copper Center
Kennecott
Nizina
Chitina
Valdez
Tenana
Fairbanks
Circle
Fort Yukon
Fort Hamlin
Miller House
Deadwood
Chandalar
Tenzieh Peak
Porcupine
Rat R.
Flats
Black
Nation
Starr
Eagle
Steel Creek
Jack Wade
Chicken
McCarthy
Mansfield
Tanana
Kimball
Dempsey
Chistochina
Mt. Santford
Mt. Drum
Tonsina
Princess William Sd.
Cordova
Hutchinbrook
Montague I.
Kayak I.
St. Elias
C. Suckling
C. Yakataga
C. Cleare
Yakutat Bay
Ocean Cape
Yakutat
Dry Bay
C. Fairweather
Lituya Bay
Icy Pt.
C. Spencer
Cross Sound
Yakobi I.
Lisianski Strait
C. Edward
Salisbury Sound
Kruzof I.
Sitka
Sitka Sound
Baranof I.
Chichagof I.
Admiralty I.
Kupreanof I.
Kuiu I.
Prince of Wales I.
C. Ommaney
Christian Sound
Coronation I.
Iphigenia Bay
Revillagigedo I.
Tongass
Clarence Strait
Wrangell
Petersburg
Frederick Sd.
Stephens Passage
Juneau
Douglas
Treadwell
Gastineau Channel
Taku Inlet
Taku R.
Stikine R.
Glacier
Skagway
Porcupine
Chilkoot
Chilkat
Haines
Dyea
Juneau
Telegraph
Telegraph Line
Cable
Mackenzie R.
Keith Bay
Arctic
Circle
Dixon Entrance
Graham Island
Queen Charlotte Islands
Anxiety Pt.
Flaxman I.
Camden Bay
Barter I.
Martin Pt.
Griffin Pt.
Demarcation Bay
Demarcation Pt.
Kotzebue Sd.
Selawik L.
Kobuk R.
Koyukuk R.
Yukon R.
Tanana R.
Porcupine R.
Chandalar R.
Sheenjek R.
Firth R.
Hess Creek
Dall
Hogatza R.
Melozitna R.
Hughes
Allakaket
Alatna R.
Koyukuk
Nulato
Kaltag
Unalakleet
Norton Sd.
Yukon Flats
Yukon Delta
Kuskokwim R.
Kuskokwim Mts.
Alaska Range
Mt. McKinley
Mt. Foraker
Mt. Hayes
Mt. Deborah
Mt. Sanford
Mt. Wrangell
Mt. Blackburn
Mt. Jarvis
Mt. Churchill
Mt. Natazhat
Mt. Walsh
Mt. Logan
Mt. Hubbard
Mt. St. Elias
Mt. Cook
Mt. Fairweather
Mt. Edgecumbe
Mt. Burgess
Mt. Mansfield
Mt. Kimball
Mt. Dempsey
Mt. Santford
Mt. Drum
Mt. Wrangell
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Mt. Edgecumbe
Mt. Burgess
Mt. Dewdney
Mt. Klotz
Mt. King
Mt. Allen
Mt. Goodenough
ALASKA
SCALE
Statute Miles, 132 = 1 Inch.
0 50 100 200 300
Rand McNally's New 11 x 14 Map of Alaska.
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Longitude West from Greenwich.
316a

inated by lofty, glacier-covered mountains rising precipitously hundreds, and in places thousands, of feet from the sea. Its densely wooded, irregular land surfaces are very rarely level. Southwestern Alaska, from the Alaskan Peninsula eastward to the Saint Elias region, has coasts of the fiord type, which are rather more open through the great waterways of Cook Inlet, Prince William Sound and Yakutat Bay. These mountainous coasts are, however, broken by the Copper River and the debouching streams at the head of Cook Inlet. This well-wooded country of surpassing beauty from Yakutat Bay to Cook Inlet thence shades westward to the desolate Alaskan Peninsula, a treeless, volcanic, upturned region, where lakes are interspersed. Southeastward of this region are the fertile islands of Afognak and Kodiak. The Aleutian Archipelago stretches from the Peninsula a thousand miles westward toward Kamchatka in the form of some 70 treeless volcanic islands, of which less than a third are inhabited. The best known are the Fox group (Uminak and Unalaska), the Nearer (Attu), Rat (Seven Peaks), and Andreanafski (Atka) groups. Isolated in the middle of the Bering Sea are the Pribilofs, the wonderful breeding grounds of the fur-seal. The Bering Sea district from Bristol Bay north is a barren coast, usually a treeless and *tundra* country. The Seward Peninsula, about 20,000 square miles in area, rises from low, sandy coasts to flat-topped uplands, rarely above 2,000 feet. The Arctic coast is low, sandy, shoal-bounded and practically uninhabited, though the forest-clad hills of the interior are roamed over by Eskimo hunters. The Yukon watershed, about 200,000 square miles in area, comprises far the greater part of the habitable regions of the Territory. In its bow-shaped course of 1,500 miles from the Canadian frontier to Bering Sea the Yukon receives three large and navigable affluents — the Porcupine, Tanana and Koyukuk. The Yukon watershed is separated from the Arctic slope by low (Endicott) mountain ranges, and from the Gulf of Alaska by lofty, snow-clad ranges — the Alaskan chain, the Saint Elias, Wrangell and McKinley groups — which rise from 9,000 to 19,000 feet. Extensive areas in the Yukon and other valleys are *tundra*—flat, undrained lands covered with a dense, rank growth of mosses, sedges and shrubs. Apart from the Bering Sea coast the Yukon Basin has extensive forest growths in its valleys, principally alders, birches, cottonwood, hemlock, poplar and spruce.

Mountains.— Some 200 miles inland and nearly parallel with the Arctic shores is the Endicott range, low mountains from 1,000 to 1,800 feet in elevation. The Coast Range, north of Cross Sound, consists of the Fairweather and Saint Elias groups — more picturesque than any other part of Alaska — over which lies the most extended glacier of America. Twelve of its peaks exceed 10,000 feet in height, while Mounts Saint Elias and Logan rise respectively to 18,024 and 19,540 feet above the sea. The Wrangell group, to the east of Copper River, is an irregular uplift of volcanic formation, which has an area of 5,000 square miles. Eight of its summits rise above 10,000 feet, Mount Blackburn reaching 16,140 feet. The Alaskan Range, the southern boundary of the Yukon Basin, extends in an unbroken chain about 200 miles from the Canadian border to the Alaskan Peninsula. Its crest line exceeds an average of 8,000 feet, with four peaks above 10,000, among which is Mount McKinley with an elevation of 20,464 feet — the highest peak of America. South of this range are the less important Chugach Mountains. Finally the Aleutian volcanic range forms the backbone of the Alaskan Peninsula. Among these peaks, and the continuation of the range through the Aleutian Isles, are the active volcanoes of Alaska, perhaps the most remarkable group in the world, Akutan, Bogoslof, Grewingk, Katmai, Korovin, Pavlof, Redoubt, Shishaldin, etc. The eruption of Katmai in 1912 is the most violent volcanic outburst known in the history of the Alaskan mainland. On the Aleutian Chain the existence of 48 volcanic craters on 25 islands indicates the frequency and violence of such disturbances in past ages.

Glaciers.— The most extensive remnants of the ice-age in North America are those found in Alaska. Along the coast from Portland Canal north and west to the Alaskan Peninsula, the mountains facing the ocean are covered with perpetual snow, from which project huge glaciers, increasing in size and in frequency as one goes north. Though the least extensive of the glacial formations, the tourist-visited glaciers of southeastern Alaska are the most widely known. Noteworthy among them are the numerous ice-streams of Sumdum Bay and Taku Inlet, the 40 or more dead glaciers of Lynn Canal and the enormous accumulations in Glacier Bay, where the Muir glacier has a face of about three miles in width and 300 feet in height. Much vaster, however, are the névés which cover the coastal mountains from Glacier Bay northwestward to Kenai Peninsula, as on these shores are to be seen nine-tenths of the permanent ice-fields of America. Of the 31 live glaciers (those which reach the sea) no less than 25 are in these regions — three in the Saint Elias group, 11 in Prince William Sound, and 11 in the Fairweather region. Prince William Sound is especially notable for its ice phenomena, since in Harriman and College fiords there are 11 live ice-rivers, the largest being Columbia glacier with a front about four miles wide, and 300 feet or more high. The greatest ice mass, however, is the Malaspina glacier, which rests on the southern flank of Mount Saint Elias as a seaward flowing ice-mass of some 1,200 square miles in area. Separated from the ocean for a score of miles by a forested moraine about five miles wide, it finally reaches the open sea at Icy Cape. There must be at least 400 glaciers in Alaska, as more than 250 have been visited, definitely located and considered important enough to be named.

Climate.— Owing to its great range of latitude, from 54° 30′ to 72° N., it is difficult to briefly describe the various climates of this vast territory. From Portland Canal northwestward to the Alaska Peninsula the coast type prevails; much cloudiness, heavy rainfall and equable temperature through warm winters and cold summers; of which Sitka and Valdez are representative. Their coldest and warmest months of average temperature and yearly rainfall (including melted snow) are as follows: Sitka. February, 33°, August, 57°, rainfall 112 inches; Valdez, January, 20°, July 51°,

rainfall 73 inches. The Bering Sea coast, little affected by the ocean temperatures, has smaller rainfall and increased range of temperature, as shown by Saint Michael, February, 2°, July, 54°, rainfall 15 inches. The interior regions have a continental type of climate, with very cold winters, warm summers and also light rainfall. The following are typical: Copper Center, January, 14°, July, 55°, rainfall 9.3 inches; Ft. Gibbon, January, 18°, July 59° rainfall, 12 inches. The climatic conditions of the Aleutian archipelago are of the insular type, as determined at Unalaska, February, 20°, July, 50°, rainfall 109 inches. Point Barrow is typical of the entire Arctic coast, with its polar climate modified by the adjacent sea, January, 21°, July, 39°, rainfall 6.6 inches. It may be added that the heaviest rainfalls occur along the southern coasts during October, in the interior during July, on the Arctic coast during August and in the Aleutian Isles during January.

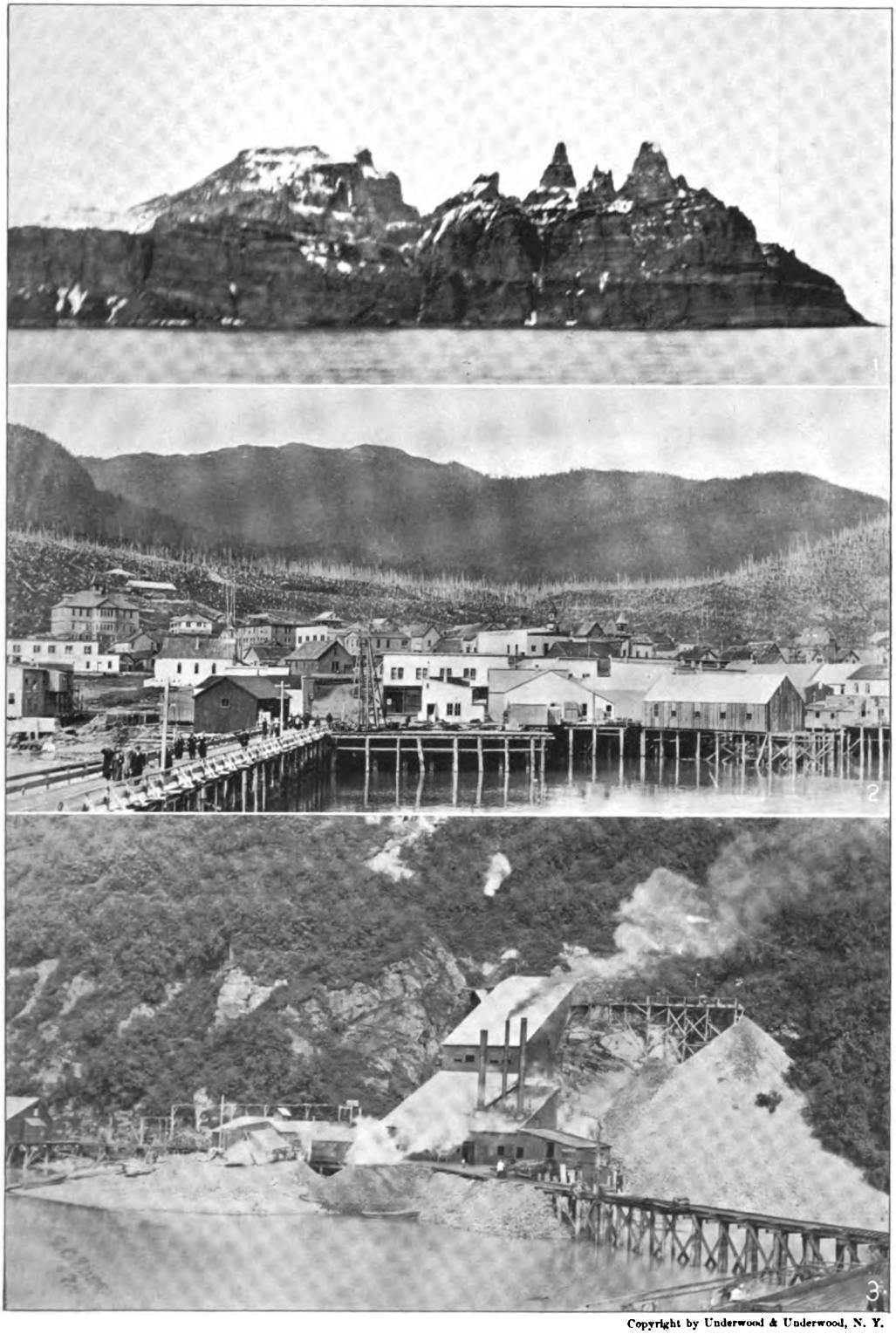
Fauna and Flora.— The species of animals, birds, fishes, etc., are varied and numerous. The Harriman expedition collected along the coast more than 1,000 species of insects. More than 150 kinds of plants are known and nearly 50 different fishes and over 200 habitant birds. Osgood records 171 species of birds from the Yukon River region alone. At sea the more important species are the fur-seal, sea-otter, hair seal, walrus and whale. On land are found five kinds of bear and six of foxes. Other animals of economic value are the beaver, caribou, ermine, goat, hare, lynx, martin, mink, moose, otter, reindeer, sheep, squirrel, wolf and wolverine.

Commerce.— The entire volume of traffic shipments in and out of Alaska for the fiscal year ending 30 June 1916, amounted to $97,646,430, including copper, gold and silver. The shipments increased enormously in value for the fiscal year ending 30 June 1917, the aggregate being $121,265,947. Articles to the value of a million dollars or more were shipped into the Territory as follows: Breadstuffs, $1,303,218; cotton manufactures, $1,530,197; explosives, $1,278,026; machinery, $3,932,189; other iron and steel, $6,209,227; meat and dairy products, $3,493,876; oils, $1,385,186; tin manufactures, $3,894,165; wood and manufactures, $1,822,549. The comparative shipments out of Alaska for the years 1916 and 1917 of the more valuable articles were: Furs and fur-skins, 1916, $588,035; 1917, $711,550; fish, $19,629,431, and $23,833,662; copper, $26,488,288 and $33,098,190; gold ores, etc., domestic $16,195,635 and $15,409,529. The salmon industry has increased greatly from shipments of $17,590,317 in 1915 to $21,195,612 in 1917, and will be very materially increased for the fiscal year 1917–18. The most phenomenal growth has been in the shipments of copper, ore, etc., which has risen in value from $5,182,004 in 1915 to $26,488,288 in 1916 and $33,098,190 in 1917. The increase in pounds has been from 35,994,812 to 117,338,937, and finally 120,670,352 pounds in 1917.

Commercial Development. Fur-Seals.— Three products have in turn dominated the commercial interests of Alaska — furs, fish and gold. Copper now forges to the front, while coal looms up in the near future. The development of these industries will be separately considered. In the minds of the multitude Alaska was for many years associated only with the furs of the otary or eared-seal. The breeding grounds of these mammals are almost exclusively confined to the Pribilofs — four isolated, barren islets in the middle of Bering Sea, of some 65 square miles in area, equidistant 200 miles from the Aleutian Isles, the Alaskan mainland and the Nome region. Set apart as a reserve by Congress in 1868, the Pribilofs were leased from 1870 to 1890 to the Alaska Commercial Company, with authority to kill 100,000 seals each year. From 1870 to 1889 inclusive the company took 197,273 pelts, valued at $29,473,050. The maximum productivity, including seals killed outside of the Pribilofs, was in the two years, 1888 and 1889, when 272,568 pelts were taken, valued at $4,333,809. In 1890 the concession passed to the Northern Commercial Company with the right to take 40,000 pelts annually. As early as 1885 pelagic or open-sea sealing by various nations in the waters adjacent to the Pribilofs, seriously affected the fishery. Thousands of seals, many with babes, were slaughtered outside of the Pribilof reserve. The annual means of 136,000 pelts taken (1888–89) fell to less than 29,000 for the five years ending 1908. The Paris convention for the correction of the evil proved to be of little value. In 1911, the governments of Great Britain, Japan, Russia and the United States agreed to a convention which promises to restore the seal herd to large proportions. Until 1926 pelagic sealing is prohibited in the seas of Bering, Japan, Kamchatka, Okhotsk and to the north of the 30th parallel of latitude in the Pacific Ocean. Aborigines living on the coasts of these regions are permitted to take native-fashion such seals as are needful for local uses. Under the convention the products obtained by sealing on the islands are to be equitably divided between the countries named, and during close seasons an indemnity must be paid by the United States to Great Britain and Japan. By the Act of 24 Aug. 1912, Congress established a close season for five years, with a proviso that resident natives may kill such seals as are necessary for food, clothing and boat-making. Under such conditions the product of fur-seals cannot average much over $200,000 annually. In round numbers the aquatic furs of Alaska from 1868 to 1915 inclusive have a value of $65,000,000, the fur-seal products amounting to about $51,000,000. The beneficial effects of the closed season at the Pribilofs are already apparent. The seals were enumerated at the rookeries with the following results: 1912, 215,738; 1913, 268,305; 1914, 294,687; 1915, 363,872; and 1916, 417,281. With the same rate of increase the seal herds should number about 550,000 when the open season begins in 1918.

Land Furs.— In comparison with the sea furs those obtained from land mammals are of minor importance, though considerable in value. The values of land furs by decades are as follows: 1871–80, $1,596,494; 1881–90, $2,360,115; 1891–1900, $2,335,862; and 1901–10, $2,381,925. The aggregate values to include 1915 amount to $11,518,188. The enormous slaughter of land animals threatened at one time the destruction of the industry, as in 1899 the product was only $45,725. Under restrictions as to close seasons, prime skins, use of

ALASKA



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1 Castle Cape

2 Town of Douglas

3 Gold Cliff Mine, Valdez Bay

poison, etc., the trade has very much improved and the maximum year of products was 1914, $632,063. The furs taken in 1914 were as follows: Ermine, 6,873; red fox, 14,967; white fox, 6,530; lynx, 6,930; marten, 6,497; mink, 65,623; muskrat, 101,202; and land otter, 1,008. In October 1915 the United States sold at auction 513 blue-fox skins at an average of $114.45, an advance of $72 over the last sale. Selected lots ran from $245 to $273 per pelt. The white fox pelts averaged $24.55. The value remained materially unchanged in 1916 and 1917. A novel industry was introduced about 1894, the breeding of foxes. Thirty or more uninhabited islands, principally situated from Prince William Sound westward to the Fox Islands, have been leased by the United States to the breeders. Few of these enterprises have resulted in returns adequate for the labor and capital therein involved.

Fisheries.— With the marked decrease in the fur products — from $3,054,414 in 1888 to $2,121,611 in 1891 — the fishery industries rose during the same period from $1,447,478 to $2,856,742 annually, thus making it temporarily of primary importance in Alaskan trade. To include 1916 the product of Alaskan fisheries aggregates in round figures, $260,000,000. Of this amount $20,000,000 came from cod, whale, halibut, etc., in contradistinction to the far more productive of all branches — the salmon industry. From 1868 to 1880 the average output of all fisheries was about $170,000. The following decade saw the product quintupled, the income from 1881–90 averaging $850,000 annually — almost half the value of the furs — of which nine-tenths were derived from the salmon. The subsequent growth in the salmon industry has been constant and astonishing. The average annual values in periods of five years are as follows: 1891–95, $2,100,000; 1896–1900, $3,400,000; 1901–05, $6,700,000; 1906–10, $11,000,000; and 1911–15, $16,900,000. Except for one year (1913) the increase has been uninterrupted from 1905 to 1915. The year of maximum productivity for this period was 1914, $19,474,393, followed closely by 1915 with values of $19,053,905. The output is again steadily increasing, the values for 1916 for canned salmon alone being $23,269,429, with the probability that this sum will be very largely increased in 1917. Although temporarily surpassed by the gold output, the salmon is now the most valuable single product of Alaska, and affects industrially the maximum number of persons. The plants are elaborate, including at least 100 canneries, and five hatcheries. The entire fisheries give employment to about 22,000 persons, of whom some 4,000 are natives. The entire investments exceed $37,000,000, of which the salmon industry alone amounts to $35,000,000.

Mineral Resources. Gold.— In 1880 Alaska began gold mining, but the yearly product was not considered of importance until it passed the million-dollar mark for 1892. The development is clearly shown by the average annual output for decades: 1881–90, $462,000; 1891–1900, $2,821,000; 1901–10, $14,572,000, and for the five years ending with 1915, $16,418,485. The total products to include 1915 aggregate $260,858,943, divided by districts as follows: Pacific Coast belt, $76,259,295; Copper River and Cook Inlet region, $6,613,783; Yukon Basin, $106,423,169; Seward Peninsula and Northwestern Alaska, $71,562,700. The mining operations of 1916 added to these figures a value of $11,140,000 in placer gold and $5,912,736 from the lode mines, a total value for the year of $17,052,736.

Of the total yield of gold in Alaska, 72 per cent is obtained from placers, 27.6 per cent from lode-mines, and 0.4 per cent from copper ores. Juneau is the most important of the lode-mining centres, although some lode-mines are in operation at Fairbanks, and in the Kuskokwim and Nome districts. In the season of 1916, 42 dredges were operating in the streams of Alaska, 37 of these being in the waters of the Seward Peninsula. These great machines recovered 94 per cent of the entire value won from Alaska's gold placers, the output of the small workings reaching little above $600,000. The Territory of Alaska, as regards its mining interests, is classified as follows: (1) The Pacific Coast Belt includes all mines in southeastern Alaska — Ketchikan, Wrangell, Juneau and Berner Bay regions. Far greatest in productivity are the quartz mines of Juneau, where the famous Treadwell lode mines on Douglas Island, the largest gold mines in the world, with their plant of concentrators, stamps, workshops, etc., have produced nine-tenths of the gold of the Pacific belt. The yield of its three largest mines in 1905 exceeded $2,000,000, and in 1908 was $3,000,000, and in 1916 attained an output of $4,500,000. Second in importance are the quartz mines on the mainland near Juneau. In 1916 there were 13 lode mines producing ore, and the output was $5,912,736, an almost uninterrupted yearly increase from 1897. The average of the past five years exceeds $5,500,000 annually. (2) The Copper River district has averaged an output of $300,000, which has increased for the past five years to $450,000, with its maximum of $605,390 in 1915. (3) The Yukon Basin has produced a larger amount of gold than any other Alaskan district. Of surpassing importance were the placer diggings of the Tanana watershed, where the Fairbanks yield of $350,000 in 1904 rose to $3,750,000 in 1905, and then gradually to $9,200,000 in 1908. The maximum for the Yukon Basin was $11,580,000 in 1909, since which time, despite the discovery of new placers in the basins of the Innoko and upper Kuskokwim, the production has fallen very gradually to $7,367,776 in 1915, of which more than $300,000 came from lode-mines. (4) The Seward Peninsula is better known to the public as the Nome region. This district sprang into fame when the unimportant output of $75,000 in 1898 rose to $2,800,000 in 1899. The yearly output reached a maximum of $7,500,000 in 1906; after that it decreased steadily to $2,535,000 in 1913, but is again tending upward, the product of 1915 being $2,920,000. The gold production from 1901 to 1907 amounted to $37,000,000, the Nome district yielding about $28,000,000. Thirty-six deep mines were operated in 1915 in the Nome district, where the total gold product was about $1,500,000, while some $700,000 came from the Council district. (5) Among smaller isolated districts the most promising for future increases with their outputs in 1915 are: Tolovana, 50 miles northwest of Fairbanks, $60,000; Kuskokwim, $110,000; Chisana, $135,000; Inoko, $190,000; Koyukuk, $300,000;

Hot Springs, $550,000, and Iditarod, more than $2,000,000. These are placer mines, in which some steam dredges are at work.

Silver.—The silver production of Alaska in 1916 amounted to 1,379,261 ounces, valued at $907,554. About nine-tenths of this was secured incidentally in the mining of copper, the amount being not far from 1,200,000 ounces. The remainder was gained in the mining of gold. An undeveloped source of silver in Alaska exists in the extensive deposits of argentiferous galena, which up to 1916 were still lying idle. Since 1880, including the output of 1916, Alaska has yielded a grand total of 6,302,459 ounces of silver, valued at $3,729,465.

Copper.—While gold has for 20 years shown the largest value among the mineral products of Alaska, it bids fair to be surpassed in importance by copper in the immediate future. For a few years prior to 1905 copper was profitably mined, to the value of about $200,000 annually, in the Ketchikan district on Prince of Wales Island. The number of working mines reached 10 in 1906 with an output of $920,000. Later rich veins were discovered on the adjacent Kasaan Peninsula, where more than 30 mines were opened. Very rich deposits of sulphides and of native copper were discovered, scattered over the country from the Saint Elias region to Cook Inlet. Rich and easily worked veins were found on the eastern shores, and adjacent islands, of Prince William Sound. The richest and most productive deposits are those in the watershed of the Chitina, on the southern flank of the Wrangell Mountains, where there are several mines and scores of prospective drifts. These deposits were so extensive and valuable that the Copper River and Northwestern Railway, 197 miles long, was built to transport the ores of the Bonanza copper mines from the northeastern terminus at Kennicott. In connection with the Bonanza, Jumbo and Mother Lode mines there have been installed tramways, concentrators, etc., for handling the immense quantities of ore produced. The production of 1914 was great, but it was quadrupled in 1915, in which year the product was 40 per cent of the grand total mined in Alaska from the beginning. From 13 mines there were obtained 86,509,312 pounds, valued at $15,139,129, besides by-products of $600,000. In 1916, 18 copper mines were operated in Alaska, yielding a total of 119,600,000 pounds. Nine of these mines were in the Ketchikan district, six on Prince William Sound and three in the Chitina belt. The greater part of the output, however, came from three large mines—two in the Copper River country, and one on Prince William Sound. The lack of transportation facilities is a serious obstacle to the development of many mining properties known to contain extensive and valuable deposits. Since 1903, the grand total of copper mined in Alaska, inclusive of the output of 1916, amounted to 339,513,375 pounds, valued at $68,839,581.

Other Metals.—Of other metals, Alaska yields small supplies, with prospects of great increases when the transportation facilities are extended to reach the mining areas. The most important output in point of size is of lead. In 1916 the lead production amounted to 820 tons, making the total yield of lead up to the close of 1916, 2,080 tons. The larger proportion of this output has been gained from gold ores, principally from the lode mines in the Juneau mainland belt, which carry considerable galena. Galena-bearing lodes are found also in the Ketchikan and Wrangell districts in southeastern Alaska; in the Fairbanks district; in the Fish River basin of Seward Peninsula; in the Broad Pass region; in the Mentasta Pass region; in the Koyukuk district; and in many other more remote localities, where distance from transportation lines renders them unavailable for the present.

Antimony has been mined in Alaska only since 1915. In that year 833 tons of stibnite, carrying about 57 per cent of antimony, was sent into the market. In 1916 the output was 1,458 tons. Most of this ore came from the six mines of the Fairbanks district. Two newly opened mines in the Nome country added a small production. The most important lode is located in the Ketchikan district, and development was begun in 1916. Other localities, accessible to transportation the year round, are lodes on Prince William Sound, on Kenai Peninsula and in the Nizina district.

Tin has been mined in the York district of the Seward Peninsula since 1902, and, later, in the Hot Springs district. The total amount recovered, including the 139 tons gained in 1916, has been 767 tons. Most of this has been obtained incidentally by dredges operating for gold in the stream beds. Two lode mines are in operation in the York district, with a small annual output. There are a number of known tin-bearing placers in York district, and stream tin is widely distributed throughout the Hot Springs district, but few miners make any attempt to save it. The York tin mining is carried on only through the summer season, and the Hot Springs placers can be worked only about three months.

Tungsten, in its ore scheelite, has been for a considerable period recognized in the gold placers of Fairbanks, Iditarod and Nome. In 1915 a scheelite-bearing lode was opened near Fairbanks, and in 1916 others were located and opened in that vicinity and also near Nome. Some of the dredges in the Nome and Iditarod districts separate the scheelite from their concentrates. Both wolframite and scheelite are found in some of the gold placers of the York district, and wolframite has also been found in some of the gold placers of the Yukon-Tanana region. In 1916 the total output of tungsten ore in Alaska was 47 tons.

Platinum began to attract the attention of the Alaskan placer miners in 1916, and 10 or 12 ounces were recovered, most of it in the newly developed Koyuk district, in the southeastern part of Seward Peninsula and in the Slate Creek placers in the upper Copper River Basin. Platinum has also been reported as in considerable quantity in the gold-bearing gravels of the Kahiltna River, and in the beach placers of Lituya Bay and of Red River, Kodiak Island.

Quicksilver occurs as cinnabar in lodes in the lower Kuskokwin region, and in nearby localities in the Yukon Basin. The extent of the deposits has not yet (1917) been defined.

Nickel and cobalt have been found in a copper-bearing lode near Pinta Cove, on the west side of Chichagof Island, in the Sitka district. There are deposits of molybdenite at several

points in southeastern Alaska, and in the Willow Creek district, but no attempt to develop them had been made up to the close of 1916. A bismuth-bearing vein occurs on Charley Creek in the Nome district, and this metal is also found in connection with gold at two points in the Tanana valley. No output was reported for 1916.

Coal.— Coal occurs in Alaska in many widely separated sections, and in many grades, ranging from a fair quality of anthracite to lignite. Much the larger part of the coal area is so remote from transportation lines as to be available only for local uses. The only area at present accessible is the Matanuska field, yielding high grade steam and coking coals, and low grade bituminous coal. This field is reached by the Matanuska Branch of the government railroad. The Bering River field, yielding high grade steam and smithing coal, and perhaps coking coal, with some anthracite, can be made accessible by the completion of the railroad now under construction, and its extension into the central and western parts of this field, where the best coal is found. The Cook Inlet field lies practically at tidewater, but yields only lignite.

Notwithstanding the extensive areas of its coal-fields, the amount mined in Alaska has been insignificant, amounting to less than 50,000 tons. The withdrawal of coal-lands from public entry in 1907 ended all mining, but legislation in 1914 provided for utilization of the coal. Over 1,200 square miles of area have been determined by survey to be coal-fields, while there are good reasons for the belief that 11,400 other square miles are underlaid by coal-bearing rocks. About 58 per cent of the known fields are of lignite, while 7 per cent are high-grade coal — there being 26 square miles of anthracite, 7 of semi-anthracite and 50 of semi-bituminous. No considerable area of high-grade coal has been found outside of the fields in the basins of the Bering and the Matanuska Rivers. By far the greater amount is in the Bering River field — 22 square miles of anthracite and 28 square miles of semi-anthracite and semi-bituminous. The coals vary from 84 per cent of fixed carbon in the anthracite to 74 per cent in the semi-bituminous. Workable Bering beds are known from 3 to 25 feet in thickness. In the Matanuska field of 46 square miles the seams vary from 5 to 30 feet in thickness. The estimates for these two fields indicate the presence of at least 3,554,000,000 tons of high-grade coal, which estimates will doubtless be largely increased when detailed surveys are made. Bituminous coal exists in large quantities in the Alaska Peninsula. Throughout the Yukon Basin coal is widely distributed, the principal fields being the Nulato (the best coal), the Washington (upper Yukon), and the very extensive Nenana lignite coals, where 66 square miles are covered by veins from 500 to 1,800 feet in thickness at many points. Three fields are known on the Arctic coast — Cape Lisburne, Wainwright Inlet and the Colville Basin.

Under the Act of 16 July 1914, the Alaskan coal lands were opened for public use. The act empowers the President to reserve for governmental purposes coal-bearing lands not exceeding 5,120 acres in the Bering River Basin, 7,680 acres in the Matanuska field and one-half of the other coal-fields. Unreserved coal lands are to be divided into blocks of 40 acres, and no combined blocks exceeding 2,560 acres in the aggregate shall pass under any one control, the leases to run for 50 years only. Limitations are imposed on aliens, corporations, railroads and other common carriers. Royalties of not less than two cents per ton are to be levied, while annual rentals rising from 25 cents per acre for the first year to $1 in the sixth and succeeding years are provided for. The royalties and rentals are to form funds for the construction of railways and for other public utilities in Alaska. Leases must contain provisions for an eight-hour day as well as other welfare restrictions in favor of the miners. For strictly local or for domestic use permits may be granted covering the mining for 10 years, without royalties, of areas not exceeding 10 acres. No less than 47,742 tons of coal were imported by Alaskans during the fiscal year 1917, which indicates the inadequacy of the coal law of 1914. See COAL LANDS.

Agriculture.— The United States has fostered agricultural interests through four experimental stations: Sitka, nursery, etc.; Kodiak, dairy, etc.; Rampart, grain; and Fairbanks, farm demonstration. Despite much effort agriculture is only successful near large settlements and to a moderate degree. The growing season of six months on the southern islands drops to four in the interior valleys. The most important products are vegetables on favored grounds in the valleys of the Susitna, Koyukuk, Copper River, and especially the Tanana. The reduced importations of vegetables, despite large increase of population, indicates the increasing volumes of these products. The values of all vegetable shipments into Alaska aggregated $700,000 in 1906, but was only $522,000 in 1915; imported hay fell from 16,044 tons in 1913 to 8,780 in 1917.

Manufactures.— Apart from the canneries the manufacturing establishments of Alaska are few. The census of 1910 reported the following additional: 22 with 178 persons engaged in lumber products; 16 with 89 persons in printing and 68 with 290 persons in miscellaneous work.

Forests.— The forestal resources have been conserved by congressional legislation. Originally about 40 per cent of the Territory was wooded, of which the coastal woodlands are now protected. The Chugach forest, over 800 square miles in area, includes most of the valuable timber in the neighborhood of Prince William Sound and on the adjacent island of Afognak. Some considerable areas in this forest have spruce and hemlock ranging from 20,000 to 50,000 feet per acre. The Tongass forest, with an area of 100 square miles, brings under national control the timber of the Sitkan Archipelago and the adjoining mainland. The timber is heavier and more valuable than elsewhere. It consists of Sitka spruce, western hemlock, western red cedar and yellow cypress. The exportation of timber from the Territory is forbidden. Wood for domestic purposes is free to all living on or near the national forests, as is the timber needed by prospectors while developing their claims. Nearly 40,000,000 feet of timber were sold from the national forests in 1915, which returned a net income of $7,265. While the woodlands of the interior are inferior in quality, consisting mainly of

small cottonwood, birch and spruce, yet they are of great economic importance in the mining districts where they are indispensable for the easy working of the frozen placers, which are thawed for exploitation. See FORESTRY IN THE UNITED STATES.

Game.— Alaska is the only part of the United States where large game is yet to be found in quantities. Under the provisions of the act of 11 May 1908, game has been conserved through close seasons, hunting and shipping licenses, and the system of licensed guides. During the breeding seasons the law protects caribou, deer, goats, bears, sheep, sea-lions, walrus and game birds. Hunting is free to residents, but non-residents must obtain licenses from the Secretary of Agriculture, ranging from $50 to $150. While game can be killed for necessary food it cannot be shipped out of the Territory. Licensed hunters are permitted to kill not more than one walrus or sea-lion, two moose, three bears, caribou, deer or sheep, and not more than 25 birds on any single day. Special permits are granted for scientific purposes.

Reindeer.— As far as the natives are concerned, reindeer-raising is the most important of the Alaskan industries. It has gradually transformed large numbers of natives from wandering hunters into domesticated stock herders. In general the reindeer herds are scattered through the *tundras* of the coast regions of Bering Sea, of the valleys of the lower Yukon and Kuskokwim, along the Arctic coast from Kotzebue Sound to Point Barrow, and on a few of the outlying islands. The deer are widely and systematically distributed to the natives under definite regulations, which foster the spirit of personal ownership and inculcate skilled methods of herding. Young natives, trained as herders by an apprenticeship of four years, ultimately receive from 24 to 29 deer as the nucleus of a personal herd. On 30 June 1914, there were 57,872 reindeer, herded at 65 separate points. Of these no less than 37,828 deer were owned by 980 natives, whose income for the year amounted to $77,934, exclusive of domestic uses. The missions and the Lapp settlers owned 15,931 head. In 1916, the herd had increased to 82,151, and by 1918 will undoubtedly exceed 100,000. Female deer can be sold only to natives and within the Territory. Male deer can be slaughtered, when over four years old, not exceeding 2 per cent of any herd. Experiments have been made and plans are in progress for the exploitation of reindeer meat commercially, and it is thought that shipments will soon attain such proportions as to be a factor in the meat supply of the entire Pacific coast.

Reservations.— Many reservations have been made by the United States in the interests of conservation and for public utilities. The army, the navy, the fishery and the lighthouse bureaus have thus been insured proper facilities for administration, free from unauthorized invasion. Among reservations elsewhere mentioned are the Chugach and Tongass forests, the Pribilof fur-seal islands and nine for native villages. Others of importance are a sea-otter reserve on Afognak Island, a reindeer station on Saint Lawrence Island a moose reserve on Fire Island. A general and very extended reservation is that of the Aleutian Archipelago, for the development of fisheries, the propagation of reindeer and for the protection of birds and fur-bearing animals. Special bird-reservations are the Bering Sea, the islands of Bogoslof, Chamisso, Forrester, Hazy, Saint Lazaria, Tuzedni and the great delta of the Yukon, the last named being a favorite breeding region for ducks and geese. The fox-farming islands are not reservations, although leased for exclusive use.

Transportation.— In summer transportation in the interior of Alaska is largely by boats on the great rivers. The principal streams are the Yukon, with its important tributaries, the Porcupine, Koyukuk and especially the Tanana, Copper, Kuskokwim, Susitna, Yentna and Kobuk. They are all navigable for steamboats from 100 miles upward. The Yukon, 1,865 miles in length, is the fifth river in size of North America. The Tanana, besides 750 miles of navigable waters, has tributaries also navigable — the Chena, Kantishna, Tolovana and Volkmar. For the interior regions, Fort Gibbon, at the mouth of the Tanana, may be called the centre of river transportation. From that point boats ply to and from Dawson, from the end of May to 1 October; Fairbanks from the middle of May to 1 November; Saint Michael from the middle of June to 1 October. Occasional boats navigate the Koyukuk and the Kuskokwim. Skagway and the Prince William Sound country are reached weekly by steamer from Seattle throughout the year, and Nome from early June to October. The railroads (see *Railroads*) are almost entirely operated in connection with mines. Land travel has been greatly facilitated by the labors of the Army Roads Commission. Under its administration there have been built to 30 June 1916, 3,759 miles of wagon roads, sled roads, pack-trails and winter trails. A stage route is operated throughout the year from Valdez to Fairbanks, about 375 miles; stages from Chitina on the Copper River Railroad connect with this route at Copper City. From Fairbanks there are sled roads (for winter travel) to Ft. Gibbon and Circle on the Yukon. Pack-trails extend westward from Gibbon to Nome and eastward to the Canadian border. They also reach northward within the Arctic circle to Candle on Kotzebue Sound, Coldfoot on the Koyukuk, Ft. Yukon on the Yukon and Barrow on the Arctic Ocean.

Railroads.— Practically all the railways of Alaska have been constructed as adjuncts to mining enterprises. They aggregate 466 miles in length, as follows: White Pass and Yukon, from Skagway, 20.5 miles; Yakutat Southern, between Minto and Situk bays, 9; Tanana Valley, from Fairbanks, 46; Council City, from Solomon, 32.5; Golovin Bay, from Council City, 5; Seward Peninsula, from Nome, 86; Copper River and Northwestern, from Cordova to Kennicott, 195; Alaskan Northern, from Seward, 72 miles. Conditions of taxation, mining, etc., were such that from 1913 to 1915 only 261 miles of these roads were operated. The necessity of additional railroads for the development of the Territory was so evident that Congress authorized such a system at public cost. Public Act 69, 12 March 1914, empowered the President to locate, construct and operate railroads in Alaska, at a cost not to

exceed $35,000,000. After surveys and studies by a commission, the President approved of what is known as the Susitna route, a line from Seward, Kenai Peninsula, to Fairbanks, on the Tanana River, about 471 miles in length, with a branch line of 38 miles to the Matanuska coal fields. The route is from Seward to the head of Turnagain Arm to Knik Arm, up the drainage valley of the Susitna and Chulitna rivers, over Broad Pass, and down the valley of the Nenana River to the Tanana valley. In order to develop as early as possible the Matanuska coal fields, work was begun on Knik Arm, where a town site was surveyed and settlement made. It is known as Anchorage, is connected with the main line by a branch of five miles, and will be the shipping point save for four months in the winter when Knik Arm is usually frozen. During the remainder of the year freight and passengers will necessarily be handled to and from Seward, with which the Matanuska section will soon be connected by rail. During 1914 about 70 miles of the Alaskan Northern Railway were rebuilt, and about 30 miles of the Matanuska section graded and bridged. The terminal station, Chickaloon, of the Matanuska coal field is now connected by rail with Seward. Construction has so far progressed that there are now being operated about 75 miles of new line, 65 miles of which is located north of Anchorage. Some of the heaviest work on the line is found between Anchorage and Kern Creek, on account of it being necessary to bench in the line on precipitous cliffs in that locality. It is estimated that the 500 miles of line from Seward to Fairbanks can be built for $27,000,000, exclusive of the $1,150,000 paid for the Alaskan Northern. Passenger service has been fixed temporarily at 12.5 cents per mile, while the freight rate for 35 miles operated is 1.25 cents per pound. Timber for construction purposes will be taken free from the Chugach forest, while local needs will be met from the timber reservation made by executive order, five miles wide on each side of the railway route from Turnagain Arm to Chickaloon and to Fairbanks.

Telegraphs and Telephones.— Ninety per cent of the towns and mining camps of Alaska, even to Kotzebue Sound, can be reached readily from any part of the world. The Signal Corps of the Army constructed, and now operates, a system of more than 4,000 miles of cable, wireless and land lines, which connects Seattle, via Sitka and Valdez, with Nome to the extreme northwest, Circle City to the central north, and along the immediate southern coast to Skagway. These lines are open to commercial use, and transact a business of such volume that the tariffs approach $225,000 annually. Private companies operate a telephone system, which from the centre at Nome reach Candle and other stations on Seward Peninsula. Similarly the mining camps of the Fairbanks district are connected with Fairbanks. The United States Navy operates radio stations at Cordova, Dutch Harbor, Saint George, Saint Paul Island and Sitka.

Education.— The whites and the natives are educated separately, the former at local and the latter at Federal expense. In 1915 schools for the white children were maintained in 14 incorporated towns and in 31 other settlements, with a force of 105 teachers and 2,503 children. Under acts of Congress the education of the Eskimo and Indians is conducted under the direction of the Secretary of the Interior, the expenses of the system being met by congressional appropriations. In 1915 such appropriation amounted to $200,000, from which were maintained 71 schools with 106 teachers. There were 3,666 pupils enrolled, while the average attendance was 1,991. The instruction is along thoroughly practical lines, and covers the moral, physical and mental training of both adults and children. Elementary English subjects, domestic science, industrial handicrafts, personal hygiene and village sanitation are the principal subjects. Nearly three-fourths of the native children between 10 and 14 years of age can read and write English. The teachers are debarred from trade. Besides their school work they aid in the reindeer service, and actively engage in the care of the sick and distressed, distributing food and clothing to the absolutely destitute and affording hospital care. In the special hospitals at Kanakanak, Kotzebue and Nulato is employed part of the force of doctors and nurses. Contract hospital service is also had through hospitals at Candle, Juneau, Nome, Seattle and Valdez.

Missions.— The Presbyterians began missionary work in 1877, and though the establishment of independent churches in the larger towns has materially modified the needs, they yet maintain three missions, as well as the hospital at Haines and the training school at Sitka. The Baptists, Congregationalists, Friends, Lutherans, Moravians and Methodists have contributed largely to religious training in Alaska. The Catholics have labored assiduously and successfully, especially in the Yukon Valley at Nulato and Holy Cross; the latter is a station monumental for its success in agriculture, stock-raising, and industrial training. The Greek Church has gone its own way with the natives near their stations. Although the Episcopalians entered the field late they have pursued their work to a greater extent than any other denomination. About $50,000 are spent annually on their 24 missions, and four hospitals, those at Fairbanks, Iditarod, Ketchikan and Valdez.

Natives.— The Indian population of Alaska has fallen from 29,536 in 1900 to 25,331 in 1910, and was estimated to be about 24,000 in 1915. As far as their racial distribution was determined in 1910 they were divided as follows: Aleuts, 1,491; Athabascans, 3,916; Eskimo, 12,652; Haidas, 530; Tlingits, 4,458; and Tsimshians, 729. The Aleuts occupy the Aleutian Archipelago, where they barely maintain life by fishing. The few Haidas live in the Ketchikan region, being offshoots from the tribe on Queen Charlotte Islands. The Tsimshians, generally known as the Metlakatlans, are for the most part living in community on the reservation of Annette Island, granted them by Congress; they are industrious, temperate and thriving. The Tlingits are the natives living principally in the Sitkan Archipelago, and along the coast northward to the Saint Elias region. Known to tourists through their totems and other customs, they have gradually abandoned old ways, many being employed in mines, fishing, etc. Living in the interior of the country, in the valleys of the Copper, Kuskokwim, Tanana and Yukon, the

Athabascans are rapidly disappearing. Both game and fish are scarce, and regular labor in mines and agriculture is confined as a rule to Indians under mission control. The Eskimo are a coastal people, whose habitat extends from the Canadian border of the Arctic shore westward to Cape Barrow, thence south and easterly along Bering Sea and the Alaskan Peninsula to Cook Inlet. Only about one-fifth live on the shores of the Polar Sea. About two-fifths occupy permanently the hunting and fishing grounds between Bristol Bay and Norton Sound, where game is abundant in some form summer and winter. The education and care of the natives are treated under the head of *Education* and *Missions*. Their conditions have materially improved during the past few years, as far as selected communities are concerned. The United States has set apart certain reservations, thus freeing them from obtrusive and demoralizing surroundings: Annette Island, Saint Lawrence Island, Hydaburg, Klawock, Klukwan, Port Gravina, Long Bay, Ft. Yukon, and on Kobuk River. The Territorial legislature has enacted laws granting citizenship, and authorizing separate self-governing towns to Indians under certain restrictions. Co-operative stores have been conducted with success by natives at Hydaburg, Atka, Klawock and Saint Lawrence Island, and are being organized elsewhere. Efforts, so far unavailing, have been made to induce Congress to bring about the betterment of the 5,000 Eskimo in the Yukon delta through the abolition of the liquor traffic and the development of industrial training. In 1915–16, however, an appropriation of $25,000 was made by Congress for the relief of natives, supplementary to the funds used in education.

Government.— Alaskan government is that of a modified territorial form. Appointed by the President, the governor has strictly limited powers. The territorial legislature, consisting of eight senators and 16 representatives, meets biennally in Juneau, the capital. Its acts are subject to veto by the governor, and only have the force of law when approved by Congress. The course of justice, administered through four district courts, is slow and expensive. The courts are supplemented by commissioners whose powers are restricted to cases involving values of not more than $1,000, and to crimes whose punishment does not exceed imprisonment for one year. The fisheries, forests, fur-seal, game and largely the natives are under Federal control, so that local administration is complicated, uncertain and not always efficient.

Population.— According to the census of 1910 the population then numbered 63,700, of whom about 36,000 were white. The governor officially estimates the white population in 1915 at 44,000. The incorporated towns and their population in 1910 were: Fairbanks, 3,541; Nome, 2,600; Douglas, 1,722; Juneau, 1,644; Cordova, 1,152· Skagway, 872; Valdez, 810; Wrangell, 743; Petersburg, 585; Seward, 534; Haines, 445; Tanana, 398; Eagle, 178 and Chena, 138. The new railway town of Anchorage, founded at the head of Cook Inlet in 1915, is estimated to have a population of 2,500. The largest native villages are: Metlakatla, 602; Chignik, 566; Karluk, 549; Sitka, 500; Kodiak, 438; Saint Michael, 415; Ft. Yukon, 331; Unalaklik, 247; Koserefsky, 231; Nulato, 230.

History under Russia.— The discovery of Alaska was due to the enterprise of Peter the Great, who a few days only before his death drew up a program for the exploration of the seas to the eastward of Kamchatka. It was not until 1741 that Bering and his lieutenant Chirikoff reached the Alaskan mainland, at Cape Saint Elias and near Cross Sound. The wealth of furs brought back by the survivors of the expedition stimulated the activities of the Russian fur-hunters, who soon made extensive discoveries along the Aleutian Chain and developed a thriving trade. From 1790 Alaska was controlled and exploited by trading monopolies, principally by the Russian American Company which had exclusive rights from 1800 to 1862. The company was required to settle the country, develop its resources, propagate the faith and to extend Russian influence in North America. Operating under the nominal control of the Imperial Department of Commerce, the chief director of the company in his remote realm of Alaska exercised despotic and often cruel sway. The natives were practically serfs, and though timid and inoffensive, were at times driven by horrid cruelties to rebellion. The most prominent of the chief directors were the brutal Baranoff (1799–1819) and the reformer Baron Wrangell (1831–36). About 20 trading posts were established by the company, the most important being Kodiak, Sitka, Saint Michael, Unalaska, Atka and Kurile. Seven missionary districts were organized, and a few schools opened, mostly by priests. Disputes arose as to the boundaries of Alaska, which were settled by conventions with Great Britain and the United States. In 1824 by convention with the United States, the southern boundary, which Russia had claimed to be the parallel of 51° north latitude, was fixed definitely at 54° 40′ N. In 1862 trade monopoly came to an end, and in 1864 the Territory came under its first imperial governor, Prince Maksutoff. Under a treaty, confirmed by the United States Senate 28 May 1867, Alaska was purchased from Russia for the sum of $7,200,000, and the country was formally occupied by the United States on 18 Oct. 1867.

American History.— Although the treaty of cession guaranteed to the civilized inhabitants of Alaska equal civil rights with American citizens, this provision was not granted, even qualifiedly, for 17 years. The army was responsible for Alaskan affairs from 1867 to 1877, without having legal standing or needful power. Then the officials of the treasury ruled for seven years, equally beyond the law and without means of control. An act of Congress 17 May 1884, gave a shadow of government to Alaska. It extended to the Territory the laws of Oregon, authorized a governor, formed district courts and a land district, granted mining rights, prohibited liquor, established schools and placed restraint on Indians. In 1899 penal codes were enacted, and in 1900 an inadequate civil government was provided, with legislation as to courts, schools, coal lands, missions, Indians, the insane, etc. Homesteads could not be legally acquired until 1903. With the discovery of extensive gold placers Alaska finally assumed such an economic importance as led to boundary disputes with Canada, which were adjusted by an international commission in 1903. In 1906 Alaska was granted the right of representation in Congress through a delegate,

and by the act of 24 Aug. 1912, the Territory was accorded a measure of home government by the creation of a territorial legislature. Although so long neglected in the way of governmental administration, Alaska has been free from murders and other serious crimes to an extent unsurpassed by any other part of the United States.

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MAJOR-GEN. A. W. GREELY,
Author of 'Handbook of Alaska.'

ALASKA BOUNDARY. See BOUNDARIES OF THE UNITED STATES.

ALASKA, Explorations in. Under Russia.— In carrying to completion the project of Peter the Great for explorations to the east of Kamchatka, Vitus Bering discovered Alaska in 1741, when he visited the Saint Elias region, while his lieutenant Chirikoff landed at Cross Sound. Incited by reports of fur wealth, enterprising Russian hunters, between 1743 and 1762, discovered and visited the chain of Aleutian isles and the peninsula adjoining. In pursuit of the Northwest Passage, James Cook in 1778 followed the greater part of the coasts from the Sitkan Archipelago northward to Icy Cape, Arctic Ocean. Taking possession of the country, the Russian-American Company, 1790 to 1860, established trading posts at many points,— the principal stations being Kodiak, Saint Michaels, Sitka and Unalaska. From these centres desultory and infrequent efforts were made to explore the adjacent regions. The principal journeys were as follows: 1791, Becheref on the Alaska Peninsula; 1796, Shultz, Lituya Bay and Lynn Canal; 1803, Bazanoff, the delta regions of Copper River; to carry out the orders of the company to explore the country to the north of Cook Inlet, in 1818, Korsakof crossed overland from the Inlet to Bristol Bay, and thence by ship to the Kuskokwim Bay, and two years later Kolmakoff visited the valley of the lower Kuskokwim River. Ascents up the Yukon River were made by Glasunof, 1835, to Anvik; by Malakoff, 1838, to Nulato; by Zagoskin, 1843, to Novikakat; while in 1863 Lukeen was the first to make the long journey to Ft. Yukon and return. Along the coasts, Vancouver surveyed in 1794 Cook Inlet and the shores thence southward to Chatham Strait; Kotzebue discovered and explored Kotzebue Sound in 1816; while Beechey in search of the Northwest Passage reached, through Elson Point, Barrow by boat. From the Hudson Bay Territory, in 1847, came a factor, Murray, who descended the Porcupine River and near its mouth established and built the trading post Ft. Yukon. In 1826 Franklin explored the Arctic Coast from the Mackenzie River westward to Return Reef, Alaska. In a renewal of the journey in 1837 Thomas Simpson filled in the unknown coast between Return Reef and Point Barrow. Between 1863 and 1865 the Kennicott party, constructing the Western Union telegraph line, surveyed the country overland from Norton Sound to the mouth of the Koyukuk River, and thence along the north bank of the Yukon as far as Ft. Yukon. When Alaska was transferred to the United States in 1867, the mainland was an unknown country except narrow fringes along the coasts, and the immediate banks of the Yukon River.

American Explorations.—The explorations from 1869 to 1898, made entirely by officers of the army, are recorded in 'Compilation of Narratives of Explorations in Alaska' (Senate Report 1023, 56th Cong., 1st Sess.). In 1869 Captain Raymond, corps of engineers, made a reconnaissance of the Yukon River from its mouth to Ft. Yukon. His astronomical observations disclosed the fact that the Hudson Bay station at that point was in American territory, and its removal was enforced. Opening weather stations at Saint Paul, Pribilofs and at Saint Michael, the signal corps began research work, which was eventually carried on at 29 stations, until Congress forbade continuance. The most important of the labors of the corps was the maintenance of an international polar station at Point Barrow, 1881–83. Its commander, Lieut. P. Ray, supplemented his scientific work by field explorations, during which he discovered Meade River and the adjacent Endicott Mountains. In 1883 Lieut. F. Schwatka explored the country between Chilkoot Inlet and Ft. Selkirk, B. C. The most important and extensive of any reconnaissance is that of Lieut. H. T. Allen in 1885. Starting from the coast at the mouth of the Copper River, with Corporal Fickett, signal corps, he ascended the Copper Valley, crossed the mountains, descended the Tanana to its mouth, and following the Yukon to the mouth of the Koyukuk ascended that valley overland to the junction of the Kanuti, and then by boat reached the mouth of John River. The journey was one of great danger and privations. Allen's discoveries added some 240,000 square miles of territory hitherto unknown, although under the control of Russia and the United States for a century. The maps of these three rivers were recognized as authoritative for 12 years, when they were revised by the geological survey. The gold discoveries of 1898 stimulated activity in exploration. In 1898–99, Abercrombie explored the country from Prince William Sound to Copper Valley for a military road. Glenn's expedition of 1898 extended from Cook Inlet toward the Tanana Basin, and that of 1899 around Cook Inlet. Burnell and Mitchell, signal corps, explored the regions of

the upper Copper and upper Tanana for telegraph routes in 1902–03. The explorations of the basins of the Noatak and Kobuk Rivers have been made by the navy, the revenue marine and the geological survey. These unknown tributaries of Kotzebue Sound were first explored by Lieut. G. M. Stoney, U.S.N., who from 1883 to 1886 made extended voyages up these rivers, supplemented by land trips in adjacent regions. Lieutenant Cantwell, revenue marine, further explored in 1884 and 1885 the Kobuk, reaching Walker Lake. Engineer McLenegan, revenue service, first visited the Noatak, traversing an extended part of the valley in 1885. Systematic surveys were made by W. C. Mendenhall, geological survey, who explored the country from Ft. Hamlin, on the Yukon, to Kotzebue Sound, traveling in 1901 via the Dall, Kanuti, Koyukuk, Alatna and Kobuk rivers. 'Ft. Hamlin to Kotzebue Sound' (Survey Prof. Paper 10.) The latest explorations, under P. S. Smith, geological survey, in 1910 and 1911, appear in Survey Bulletin 536, 'The Noatak-Kobuk Region.' By far the most important explorations from an economic standpoint are those made by the United States Geological Survey, whose labors have contributed enormously to the material development and prosperity of Alaska. Working primarily in the interests of mining, the survey covered, from 1898 to 1915, 202,391 square miles of area, divided as follows: Detailed surveys, 3,731 miles; exploratory, 51,680 miles; and reconnaissance, 146,980 miles; thus including in its work one-third of the Territory. The geological surveys aggregated 177,963 square miles. The National Geographic Society's expedition of 1917 under the direction of Dr. Robert F. Griggs, explored the Mount Katmai region, called by the Indians "the valley of ten thousand smokes," and reported the Katmai crater the largest in the world, nine miles in circumference, and 3,600 feet deep. The region has over a thousand active volcanic vents within an area of 100 square miles, and is declared by Dr. Griggs to be one of the wonders of the world.

Bibliography.— Among the many valuable publications of the survey the following cover the more important phases of exploration: Brooks, 'Geography of Alaska' (Prof. Paper 45); 'In Northern Alaska Across the Rocky Mountains' (Prof. Paper 20); Brooks, 'Mount McKinley Region' (Prof. Paper 70); 'The Koyukuk-Chandalar Region' (Bull. 532); Brooks, 'Railway Routes to Fairbanks' (Bull. 520). MAJOR-GEN. A. W. GREELY.

ALASKAN BOUNDARY COMMISSION, a mixed tribunal which met in London, England, 3 Sept. 1903 to arbitrate on the contentions of the Canadian government with regard to the boundary line between Alaska and Canada, from Mount Saint Elias to the Portland Canal. The commission consisted of three Americans and three Britons, the American commissioners being Secretary Root, Senators Lodge and Turner, while the British commissioners were Lord Alverstone (formerly Sir Richard Webster), English, Sir Louis Jetté and Mr. A. B. Aylesworth, Canadians. Ex-Secretary Foster was counsel for the American side and Mr. Clifford Sifton for the British side.

In May 1898 the United States and Great Britain agreed to appoint an Anglo-American Joint High Commission to consider and put on a satisfactory basis the regulations of the North Atlantic fisheries, commercial reciprocity, the Bering Sea fishery question and other disputes which disturbed relations between the United States and Canada. When the questions for the deliberation of this commission were fixed, no mention was made by Great Britain of any divergence of opinion regarding the Alaskan boundary,— but on 1 Aug. 1898 the British government informed the United States that a difference of views existed as to the provisions of the treaty of 1825, which defined the Anglo-Russian boundary. On 23 August Great Britain submitted its claims, enumerated below. It was proposed to arbitrate the matter, but the High Joint Commission could not agree. The United States rejected a European umpire for American territory and the Canadians would not agree to an American judge. The final compromise was the above-mentioned tribunal.

Previous to the discovery of gold in the Yukon region there was no dispute, or occasion for dispute, as to the course of the boundary line defined by the Anglo-Russian treaty of 1825. For 73 years it had been tacitly recognized by all nations, including Great Britain. The history of that treaty is interesting. The government of the Tsar had from time to time by ukase asserted exclusive jurisdiction over the coast lands and the waters of Alaska, to prevent any encroachment by the British Hudson's Bay Company upon the monopoly of the Russian-American Fur Company which had established its stations and carried on its trade in the islands and along the coast of Alaska extending northward from the Portland Canal. Disputes arose, and in the attempt to settle them the negotiations were begun which led to the signing of the treaty of 1825. The purpose of Russia in that negotiation was altogether to shut out Great Britain from the coast and the waters in which the Russian company was carrying on its business. The attempt of Great Britain was to secure a foothold upon the coast with the obvious purpose of getting an opportunity for the Hudson's Bay Company to establish its stations there, which was the very thing Russia sought to prevent.

The negotiations lasted from 1822 to 1825, Count Nesselrode and M. de Poletica conducting the Russian case, and Sir Charles Bagot first and Lord Stratford de Redcliffe finally, the British case. At that time Great Britain feared that the United States would insist upon retaining possession of the whole Oregon territory up to the Russian line at the historic parallel of 50° 40'. This would have shut off Canada from the Pacific coast entirely, and the British, therefore, made strenuous efforts to get an outlet through the Russian coast strip, making various propositions, one after the other which the Russians rejected, stubbornly adhering to their original proposition, which in the end prevailed.

The British first asked to have the boundary line drawn straight down the 141st meridian to the sea at Mount Saint Elias, thus depriving Russia of the entire "panhandle" of Alaska, and

causing her even to relinquish Sitka, the colonial capital. This was peremptorily rejected by Russia without serious consideration. The British next proposed Christian Sound, Chatham Strait and Lynn Canal as the boundary, leaving Baranoff Island to Russia, but giving to the British Juneau, Admiralty Island, and everything to the south and east thereof. This was also rejected. Then Clarence Strait and the Stikine River were proposed, leaving Prince of Wales Island to Russia, but giving to Great Britain the islands of Wrangell and Revilla-Gigedo. This also the Russians rejected. Finally the British commissioners conceded to Russia the whole strip down to 54° 40', but sought as a last resort to have the coast line drawn straight across such arms of the sea as Glacier Bay and Lynn Canal, from headland to headland, so as to give the British access to tidewater. This, too, the Russians, inexorably refused to grant, and in the end they won on this point as on all the others. From first to last the constant and inflexible Russian contention was for Russian possession of an unbroken strip of coast from Mount Saint Elias to Portland Canal, and in the treaty of 1825 that contention was explicitly upheld and confirmed.

That Russian title was transferred to the United States in 1867, and from that time to the present the United States has stood for precisely what Russia stood for in 1822–25.

In 1898, however, as already stated, following the discovery in 1896, of the rich gold deposits in the Klondike district, the Canadian government set up a claim based upon a new understanding of the Anglo-Russian treaty. The main contention, which, by the way, never had any cordial support from qualified experts in Great Britain, was whether the line of demarkation between the southeastern end of Alaska and the British northwest possessions cut through the inlets and estuaries of the Pacific or went around them, leaving all these waterways in American territory and preventing Great Britain from access to the sea. The British contended that the boundary line, which was defined by treaty as running parallel with the sinuosities of the coast at a distance of 30 marine miles inland, except where parallel mountain ranges were nearer, when it was to follow these ranges, was to be construed as running parallel to the coast of the Pacific and not parallel to the shores of the inlets of that sea, thus constituting a political rather than a physical coast line. If the British contention had been granted, Dyea and Skagway, two important ports on the Lynn Canal, and the prominent places of export and import for the Yukon and Klondike gold fields, would be in Canadian territory. So would the Porcupine gold fields.

On account of the apparent clearness of the terms of the Anglo-Russian treaty in 1825 it may seem difficult to imagine how any interpretation different from that argued for by the United States could have been put forth. The original treaty, however, was in French, and dispute arose as to the precise translation of "crête," meaning crest, "lisière," meaning strip, and "côte," usually translated as coast.

The treaty also laid down the boundary on supposed topographical conditions which did not exist. When the treaty was drawn up the framers relied upon some of the maps of Captain Vancouver, and from observations in the small section of British Columbia which he explored it seemed apparent that the whole coast was bordered by a range of mountains which ran parallel to and at a distance of from 25 to 30 miles from the sea.

As a matter of fact there is a jumble of mountains in various places along the coast, but in no case is there a well-defined watershed. The "crests" mentioned in the treaty were even more difficult to decide upon, and with the difference of opinion as to whether the coast line as intended in the treaty ran through the inlets or around them there were grounds for disputes, for the settlement of which an international tribunal became necessary.

The treaty between the United States and Great Britain, of which the appointment of the Alaska tribunal was the consequence, therefore decided that the following questions should be decided upon:

1. What is intended as the point of commencement of the line?

2. What channel is the Portland Channel?

3. What course should the line take from the point of commencement to the entrance to Portland Channel?

4. To what point on the 56th parallel is the line to be drawn from the head of the Portland Channel, and what course should it follow between these points?

5. In extending the line of demarkation northward from said point on the parallel of the 56th degree of north latitude, following the crest of the mountains situated parallel to the coast until its intersection with the 141st degree of longitude west of Greenwich, subject to the condition that if such line should anywhere exceed the distance of 10 marine leagues from the ocean then the boundary between the British and the Russian Territory should be formed by a line parallel to the sinuosities of the coast and distant therefrom not more than 10 marine leagues, was it the intention and meaning of said convention of 1825 that there should remain in the exclusive possession of Russia a continuous fringe or strip of coast on the mainland, not exceeding 10 marine leagues in width, separating the British possessions from the bays, ports, inlets, havens and water of the ocean, and extending from the said point on the 56th degree of latitude north to a point where such line of demarkation should intersect the 141st degree of longitude west of the meridian of Greenwich?

6. If the foregoing question should be answered in the negative, and in the event of the summit of such mountains proving to be in places more than 10 marine leagues from the coast, should the width of the "lisière" which was to belong to Russia be measured (1) from the mainland coast of the ocean, strictly so-called, along a line perpendicular thereto, or (2) was it the intention and meaning of the said convention that where the mainland coast is indented by deep inlets, forming part of the territorial waters of Russia, the width of the lisière was to be measured (*a*) from the line of the general direction of the mainland coast, or (*b*) from the line separating the waters of the ocean from the territorial waters of Russia, or (*c*) from the heads of the aforesaid inlets?

7. What, if any exist, are the mountains referred to as situated parallel to the coast, which mountains, when within 10 marine leagues from the coast are declared to form the eastern boundary?

The United States made no actual claim. She reiterated her right to territory which she proved had been recognized as hers by Great Britain and by various official acts of Canada. Various maps were produced to show that Russia had been entitled to the disputed territory and that after the purchase of Alaska that same territory was mapped and charted as belonging to the United States.

Among the maps put in evidence was the British Admiralty Chart No. 787, corrected to April 1898, in which the boundary line follows the sinuosities of the actual sea-coast, and deprives Canada of the inlets which cut into the continent. It was proved also that post offices have been maintained on various points of the disputed strip; that custom-houses have been established there and have collected duties, and that government and mission schools, particularly at the head of the Lynn Canal, have been maintained for nearly 20 years. The fact that the possession of the territory by Russians and later by Americans had not been disputed from 1825 until 1898 was also put forth by the United States in support of her claim.

The British contention rested primarily on the claim that it would have been impossible to trace at a distance of 30 miles the intricate convolutions of the line forming the edge of the salt water, and that therefore a general coast line, including many of the islands and disregarding many of the inlets, was the intention of the framers of the Anglo-Russian treaty. If the 30-mile limit were applied to such a coast, the boundary line would, of course, cut across all the deeper inlets, giving the British immediate access to the interior.

The British also submitted an argument placing a new interpretation of that clause of the treaty which provides that where the boundary line follows the mountain ranges, the crests of these mountain peaks shall mark the precise line of demarkation. It was demonstrated in the rush to the Klondike that there was no general line of mountains anywhere near the coast, but a number of peaks and small mountains were scattered disconnectedly close along the coast.

The British claim that the boundary line should follow the crests of these isolated peaks, had it been allowed, would have deprived the United States of a great portion of their 30-mile "lisière." The British cited the action of American surveyors in 1893 in support of their interpretation of "coast."

Dr. T. C. Mendenhall, superintendent of the United States Coast and Geodetic Survey, in that year directed his subordinates to carry their operations inland "30 nautical miles from the coast of the mainland in a direction at right angles to its general trend." In regard to the mountains it was contended that a gap does not discontinue the general line of the range.

The official report of the tribunal was signed and issued on 20 Oct. 1903. The signatories were Lord Alverstone, the British commissioner, and the three American commissioners, who constituted a majority of the tribunal, the Canadian commissioners refusing to sign.

All the American claims were granted with the exception of those in regard to questions 2 and 3, in which the British contentions were upheld. The original treaty specified that the line should run from the southernmost point of Prince of Wales Island (Cape Muzon) to Portland Channel. The course of this line, according to the United States, is due east about 70 miles.

The British locate it a little north of east about 66 miles to what they call Portland Channel, and what the Americans call Pearse Channel. The American claim is made on the map of Captain Vancouver, who first scientifically investigated the territory, and the British claim was made upon the text of Captain Vancouver's book, which differed slightly from the map.

A substantiation of the American contention would have given to the United States Pearse and Sitklan islands, which command the entrance to Fort Simpson, to which point Canada proposes to build a new transcontinental railway.

The decision in regard to Portland Channel or Canal gave Canada Pearse and Wales islands, while the United States obtained Sitklan and Kunnughunnut islands and the broad southern portion of the channel. Three opinions were also delivered to Messrs. J. W. Foster and Clifford Sifton, the agents respectively of the United States and Canada, one by the United States commissioners discussing the Portland Canal claims; another by Lord Alverstone on the general issue, and a third by the Canadians protesting in the most emphatic language against all the American claims. The chief interest in the decision lay in the conclusions upon the fifth or main question of Lord Alverstone, who by his impartial and high-minded course refuted the assumption on which was based the principal objection to the former treaty, that not even on the bench could a British subject be found who would not persist in upholding the supposed interests of his country, no matter how cogent might be the appeals to his sense of justice or of equity.

The following is an abstract of Lord Alverstone's conclusions:

"The broad, undisputed facts are that the parties were engaged in making an agreement respecting the archipelago and islands off the coast and some strip of land upon the coast itself. The western limit of these islands extends in some places about 100 miles from the coast and the channels or passages between the islands and between the islands and the coast are narrow waters, their widths varying from a few hundred yards to 13 miles.

"In ordinary parlance no one would call the waters of any of these channels or inlets the ocean. I agree with you as presented on behalf of Great Britain that no one coming from the interior and reaching any of these channels, particularly the head of Lynn Canal or Taku Inlet, would describe himself as being upon the ocean, but on the other hand, it is quite clear that the treaty does regard some of these channels as the ocean. This consideration, however, is not sufficient to solve the question. It still leaves open the interpretation of the word coast, to which the mountains were to be parallel. . . .

"There is, so far as I know, no recognized rule of international law which would by implication give a recognized meaning to the word

coast as applied to such sinuosities and such waters different from the coast itself. As I have said more than once, the *locus in quo* to which the treaty was referring precludes the possibility of construing the word coast in any particular article in any special way if it does not refer to the coast line of the continent. I think the words upon the border of the continent comprised within the limits of the Russian possessions in Article V rather confirm the view that Russia was to get a strip all along the continent, but I do not think that much reliance can be placed upon this because of the provision regarding the rivers and streams in Article VI.

"Turning from the language of the treaty to the record of the negotiations, I have been unable to find any passage supporting the view that Great Britain was directly or indirectly putting forward a claim to the shores or ports at the head of inlets. This is not remarkable inasmuch as no one at that time had any idea that they would become of any importance. . . . The language of both the British and Russian representatives in reporting the conclusion of the treaty to their respective governments is in accordance with the view I have suggested . . . I have little doubt that if shortly after making the treaty in 1825 Great Britain and Russia had proceeded to draw the boundary provided by the treaty, the difficulties and in certain events the impossibilities of drawing the boundary in strict accordance with the treaty would have been evident.

"I can, therefore, understand and appreciate the contention of Great Britain that under existing circumstances difficulties in delineating the boundaries described must arise in one view and might arise in any view. But these contentions, strong as they are in favor of a just and equitable modification of the treaty, do not, in my opinion, enable one to put a different construction upon the treaty. I think the parties knew and understood what they were bargaining about and expressed the terms of their bargain in terms to which effect can be given. The fact that when, 75 years later, the representatives of the two nations attempted to draw the boundary in accordance with the treaty they were unable to agree as to its meaning does not entitle me to put a different construction upon it.

"In the view I take of the terms of the treaty itself it is unnecessary to discuss the subsequent action. Had the terms of the treaty led me to a different conclusion and entitled me to adopt the view prescribed by Great Britain, I should have felt great difficulty in holding that anything done or omitted to have been done, by or on behalf of Great Britain, prevented her from insisting upon a strict interpretation of the treaty, nor do I think the representations of the map-makers that the boundary was assumed to run around the heads of the inlets could have been properly urged by the United States as sufficient reason for depriving Great Britain of any rights she had under the treaty had they existed."

ALASKA RAILROAD, The. See ALASKA — *Railroads;* ALASKA. RAILROAD ACT.

ALASKA RAILROAD ACT, approved April 1915, for the building of the Susitna or Seward route, extending from Seward on Resurrection Bay to Fairbanks, 471 miles inland on the Tanana River. It includes the existing Alaska Northern Railroad, purchased for $1,150,000, running from Seward through the Kenai Peninsula almost to Knik on the Matanuska River, a distance of about 100 miles. A side line is projected from Matanuska Junction to the Matanuska coal region, perhaps the most valuable field of high-grade coal in Alaska. The estimated cost of construction of the line from Seward to Fairbanks including the 38-mile Matanuska branch, was $26,800,000. The road eventually will probably be extended to the Yukon, tapping the great interior valleys with their vast agricultural resources.

ALASKA TREATY. See ALASKAN BOUNDARY COMMISSION.

ALASSIO, ä-läs'sē-ō, small seaport and summer resort in the province of Genoa, Italy, situated on the Gulf of Genoa, about 48 miles southwest of the city of Genoa. Pop. 6,000.

ALAS'TOR, in Greek mythology, a surname given to Zeus as the avenger; also the name of an avenging demon who follows the sinner and drives him to fresh crime. In the Middle Ages the name was given to a house-demon, the skeleton in the cupboard.

ALATAU, ä'lä-tou', a range of mountains in central Asia, forming the boundary between Mongolia and Turkestan.

ALATYR, à-là-tir' Russia, a town in the government Simbirsk, at the confluence of the Alatyr with the Sura, with a considerable trade. Pop. about 15,000.

ALAUDA, a genus of insessorial birds, which includes the larks. See LARK.

ALAUX, al-ō', **Jean,** called "LE ROMAIN," a French painter: b. Bordeaux 1786; d. 3 March 1864. He was a pupil of Vincent and Guérin; in 1815 took the Prix de Rome with the painting of 'Briseis Finding the Body of Patroclus in the Tent of Achilles.' He executed many portraits and other works. His historical paintings in the Museum of Versailles are famous: 'Battle of Villaviciosa,' 'Valenciennes Taken by Assault by Louis XIV,' 'States-General of Paris under Philippe de Valois,' 'Assembly of Notables at Rouen under Henry IV,' 'States-General of Paris under Louis XIII' and the 'Reading of the Will of Louis XIV.' He spent nine years in painting the 86 pictures which decorate the hall of the States-General of Paris. He was director of the Academy of France from 1847 to 1850, and in 1851 became a member of the Academy. His brother, Jean Paul Alaux, called "La Gentil," born in 1788, was director of the School of Design at Bordeaux.

ALAVA, Spain, a hilly province in the north; one of the three Basque provinces; area, 1,175 square miles; covered by branches of the Pyrenees, the mountains being clothed with oak, chestnut and other timber, and the valleys yielding grain, vegetables and abundance of fruits. There are iron and copper mines, and inexhaustible salt springs. Capital, Vittoria. Pop. about 98,000.

ALB (from Lat. *albus,* white), a clerical vestment worn by priests while officiating in the

more solemn functions of divine service. It is a long robe of white linen reaching to the feet, bound round the waist by a cincture and fitting more closely to the body than the surplice.

ALBA, the name of several towns in ancient Italy, the most celebrated of which was Alba Longa, a considerable city of Latium, according to tradition built by Ascanius, the son of Æneas, 300 years before the foundation of Rome. It was at one time the most powerful city of Latium and the head of a league of the Latin cities, but fell during the reign of Tullus Hostilius when the town was destroyed and the inhabitants removed to Rome. It was long believed that the modern Albano occupies the site of Alba Longa, but Cluver disproved this in 1624. It is probable that its site was on the western side of the Lacus Albanus, where the modern Castel Gandolfo stands, immediately to the north of which a prehistoric necropolis was discovered in 1817, buried under volcanic ashes and containing burial urns shaped like round huts. Alba Pompeia (modern Alba), an episcopal city in the province of Cuneo, on the Tanaro, 30 miles southeast of Turin. It contains rare collections of ancient coins, manuscripts. household utensils, etc. The district produces grain, cattle, wine, silk, cheese and truffles. Pop. (1911) 14,176. Another Alba, called Alba Fucentia or Fucentis, was near the Lacus Fucinus. The cyclopean walls of the old town are still to be seen in excellent preservation. Consult Promis, C., 'L'Antichità di Alba Fucense' (Rome 1836).

ALBA, Duke of. See ALVA.

ALBACETE, äl'bą-thā'tā, Spain, town and capital of the province of the same name, on the highway and railway between Madrid and Cartagena. It lies in a fertile but treeless plain. Albacete, from its position, is a place of considerable business; and carries on trade, both direct and transit, with Murcia, Alicante, Valencia and Madrid, exporting grain, saffron and cattle; and importing codfish, sardines, rice, sugar, wine, iron, cloths, etc. A good deal of cutlery is made here. Pop. 25,000.

ALBA LONGA. See ALBA.

ALBAN, äl'băn, **Saint,** protomartyr of Britain, 303. A native of Hertfordshire, he was tortured and executed at Verulamium by command of the prefect, Asclepiodotus. When tranquillity was restored a chapel was erected over his grave; in 795 Offa, King of the Mercians, founded a large monastery upon the spot and Pope Adrian IV (1154–59) directed that he should hold the first place among the abbots of England. His festival is celebrated by the Roman Catholic Church on 22 June, and by the Anglican Church on 17 June.

ALBANEL, ōl'băn-ĕl', **Charles,** Jesuit: b. Auvergne 1616; d. Sault Ste. Marie 1696. He entered the order in 1633, arrived in Canada in 1649, and accompanied the first French expedition from Quebec to Hudson Bay 1671–72, designed to take possession of that region in name of the French King. In 1674 he revisited the bay, was taken prisoner by the English, sent back to Europe, and on his release returned to mission work in Canada.

ALBANI, äl'bă-ni, a powerful family of Rome, which has supplied the Roman Catholic Church with several cardinals. Two of them are well known as patrons of the fine arts: (1) ALBANI, ALESSANDRO, b. 1692; d. 1779; he was a great virtuoso and possessed a collection of drawings and engravings which at his death was purchased by George III for 14,000 crowns. (2) ALBANI, GIOVANNI FRANCESCO, nephew of the former, b. 1720; d. 1803; a great friend of the Jesuits, and in every respect liberal and enlightened. His palace was plundered by the French in 1798, when he made his escape to Naples stripped of all his possessions.

ALBANI, Emma (stage name of Marie Louise Cecilia Emma Lajeunesse), Canadian dramatic soprano: b. Chambly, near Montreal, Canada, 1 Nov. 1852. After studying with Lamperti, at Milan, she made her début at Messina (1870), in 'La Sonnambula,' under the name of Albani, in compliment to Albany, N. Y., where her public career began at the age of 12. In 1878 she married Ernest Gye of the Covent Garden Theatre. She sang in opera in London, Berlin, Paris, Saint Petersburg and in the principal cities of the United States. Among her principal rôles were Elsa in 'Lohengrin,' Elizabeth in 'Tannhäuser,' Senta in 'The Flying Dutchman,' Marguerite, Mignon, Lucia, Isolde and Ophelia. Madame Albani has sung also in oratorio. Consult her memoirs, 'Forty Years of Song' (London 1911) and Edwards, H. S., 'The Prima Donna' (ib., 1888).

ALBANI, Francesco, a famous painter: b. Bologna 1578; d. 1660. He entered the school of Dionysius Calvaert, a Flemish painter, who had a great reputation in Bologna. Albani was one of his most distinguished scholars, but quitted him for Ludovico Carracci, under whose instruction he made rapid progress. He labored here several years in connection with Domenichino, to whom he was closely attached by friendship and love of art; and some resemblance is perceptible in their manner of coloring. But in invention he surpasses his friend, and indeed all his rivals of the school of Calvaert. His female forms Mengs places above those of all other painters. Among the best known of his compositions are the 'Sleeping Venus,' 'Diana in the Bath,' 'Danaë Reclining,' 'Galatea on the Sea,' 'Europa on the Bull.' Scriptural subjects he has less frequently selected, but when he has, the paintings are principally distinguished for the beauty of the heads of the angels. He had a prosperous school in Rome and Bologna. The scholars of Guido, with whom he vied, accused him of effeminacy and weakness of style, and maintained that he knew not how to give any dignity to male figures. He has been called the Anacreon of painters.

ALBANIA, äl'bā'nĭ-a. The geographical region known as Albania before the Balkan war (1912–13) was made up of the Turkish provinces of Scutari (the ancient Illyrium) and Yanina (the ancient Epirus), and parts of the Ottoman vilayets of Kossovo and Monastir. It lies in the western part of the Balkan Peninsula and was bordered on the west by the Adriatic, on the northwest by Montenegro, on the north and northeast by Serbia, on the east by Macedonia and on the south by Greece. The southern part of Albania is of a volcanic character and earthquakes are very frequent, although not very intense. Since the independence of Albania was proclaimed in November 1912 its frontiers have been ill-defined and

constantly changing. The eastern natural boundary is a mountain range, which attains in its highest peak an altitude of 8,858 feet. Westward of this range lie parallel chains enclosing long, elevated valleys sinking to level strips along the coast, which, while fertile and well watered, are very unhealthy and swampy. The highlands advance to the sea, forming steep, rocky coasts. One promontory, the Glossa (ancient Acroceraunia), projecting in Cape Linguetta far into the sea, reaches a height of 6,642 feet. The most important lakes are Skadar (Scutari), lying for the most part in Montenegro, Ochrida and Janina. The principal rivers are the Boyana, Drin, Shkumbi, Mać (Matli), Voyussa and Devol. The climate in the highland is healthful but subject to violent changes and excessive cold in winter. The sea-coast is malarial in parts and exposed to the violent bora or north winds. The principal ports are Drač (Durazzo) and Sindjin (S. Giovanni di Medua). The estimated probable area of the country is between 10,500 and 11,500 square miles, and the population between 800,000 and 850,000 souls.

Industries.— The Albanians, especially in north, have never been an agricultural people, and although the soil, apart from some chalky regions, is fertile, great tracks remain uncultivated. In the cultivated areas the methods used are exceedingly primitive, and agricultural and industrial development is further hindered by lack of transportation, there being no railways, few roads and few bridges. In the north little is cultivated but maize; the mountain terraces are used as pastures for horses, cattle and sheep. In the south the slopes of the lower valleys are covered with olives, fruit and mulberry trees, intermixed with patches of vines and maize, while the densely wooded mountain ridges furnish valuable supplies of timber. The plateau of Janina yields abundance of grain; and in the valleys opening to the south the finer fruits are produced, along with maize and wheat. In 1902 the chief exports were wool, hides, olives, fish, fruit and maize. Durazzo, Valona and Scutari are the chief towns. Industries are primitive and include fishing, extraction of sea-salt, gold and silk embroideries and filigree work. Tobacco is produced in abundance and is of excellent quality. The mountains are thought to be rich in minerals, especially copper and coal, but mining is practically unknown.

The People.— The inhabitants (called by the Turks "Arnauts," by the Serbians "Arbanassi" and by themselves "shkipetar") are the descendants of the ancient Pelasgs and are divided into two main groups: the Ghegs, who live in the north, and the Tosks, who live in the south. They have an hereditary aristocracy and a kind of feudal system. The Ghegs are divided into tribes, the principal of which are the Malissori and Minidits. They are half-civilized mountaineers; frank to a friend, vindictive to an enemy. They are constantly under arms, live in perpetual anarchy, every tribe being at war with its neighbor, and manage their affairs according to their own peculiar customs and code of honor, so called "bessa." They are haughty, simple and brave and have always been excellent soldiers. The Tosks are more civilized and have hitherto been under the guidance of a system of beys or chiefs and acknowledged the Ottoman code of law. But in reality their tribes ("fisses") have self-created an administration of a somewhat aristocratic-republican character with a "voyvoda" (duke) as chief leader in war and peace who is at the same time the head of a council of chosen senators. At the beginning of the 15th century the Tosks had a legislator called Dukashin. Their ancestors, the Pelasgs, were at first subjugated by the ancient Hellenes and later by the Romans. About two-thirds of the Albanians are Moslems; the northern Christians are mostly Roman Catholic, the southern Orthodox Greek. There are a few Roman Catholic and Orthodox schools, but education may scarcely be said to exist as yet. The free schools, which were founded by a Serbian scholar and celebrated writer, Dositey Obradovič, in the beginning of the 18th century, died out as soon as their founder left the country.

History.— The Albanians are among the oldest peoples in Europe. Their country formed part of the Roman provinces of Illyria and Epirus, and after the dismemberment of the Roman Empire it became part of the Byzantine Empire. In 640 A.D. northern Albania was invaded by the Serbians, with whom they adopted later (1288) the Christian faith, and in the 9th century southern Albania was conquered by the Bulgarians. The Normans, Venetians and Byzantines disputed the territory with them, but until the 14th century the Albanians remained the greater part of the time nominally under Serbian rule, never, however, losing in any high degree their nationality. Upper Albania and part of southern Albania were ruled by the Montenegrin princely family of Balša or Balsici of Provençal origin. In 1360, after the death of the Serbian Emperor Dušan the Mighty, they regained complete independence under native chiefs until 1431, when the Turks captured Yanina. The Albanians, united for the first time under their great leader George Kasriot, or Skanderbeg (1404–67), successfully resisted in 1443 the Turkish invasion, but on the death of Skanderbeg (1467) the principality he had founded was taken over by the Venetians, and after the fall of Scutari in 1478 the Albanians passed nominally under Turkish rule. They still preserved intact their racial and national characteristics and maintained a large degree of independence augmented by their conversion to Mohammedanism in the 16th and 17th centuries. This was a cause of further estrangement from their neighbors, the Bulgarians, Greeks and Serbs, who remained Christians, and their aloofness was encouraged and utilized by the Turks, who in the second half of the 18th century through the pashas of the notorious Bushatli family succeeded in acquiring from the Sublime Porte the right of succession in northern Albania and Kara-Mahmud Pasha made himself an absolute satrap after several battles which he won from the Turks. But in 1796 he perished in a battle against the Montenegrins. In the 18th and early 19th century Albania regained for a brief period her independence under Ali Pasha of Janina (1740–1822). Mustafa Pasha made (1831) a decisive effort to shake off Turkish dominion but was utterly defeated by the Grand Vizier Reshid at Skadar and surrendered. After that disaster Albania came definitely under the

Ottoman sovereignty but the liberty-loving Albanians rose in rebellion against their oppressors in 1833, 1836 and 1842. The Albanians in the south followed the example of their northern brothers and rebelled in 1843 and 1847, but were mercilessly suppressed and crushed by Omer Pasha. Among other rebellions that took place in Albania mention must be made of that of 1872 when the Meredits joined hands with the Montenegrins and resisted stubbornly Dervish Pasha. Stimulated by the Turkish revolution of 1908 and the despotism of the Young Turks the powerful Malissori contributed to bring about the Balkan war (q.v.) of 1912. The Balkan allies wished to divide Albania among themselves, but were opposed by Austria-Hungary and Italy. At Valona 28 Nov. 1912 Albania was declared independent, a provisional government was set up under Ismail Kemal Bey and on 20 Dec. 1912 the London Ambassadorial Conference of the Great Powers acknowledged the autonomy of Albania, and later approximately defined the frontiers and appointed Prince William of Wied sovereign (in Albanian "M'pret," a corruption of *Imperator*) of the new country, to be supported by an International Commission of Control of six members. The Prince arrived in Durazzo 7 March 1914, but after the outbreak of the European war fled from the country with most of the members of the commission. An attempt made by Essad Pasha to set up a military form of government failed (5 Oct. 1914) and Albania fell into a state of anarchy. On 25 Dec. 1914 the Italians captured Valona. Had the new principality survived its area would probably have been 10,000 to 11,500 square miles and its population between 800,000 and 850,000. But the total Albanian population is computed to 1,700,000, of which number 250,000 live in Greece, 100,000 in southern Italy, while many thousands live in Asia Minor and in European Turkey.

Language.— Authorities are not in complete accord over the origin of the Albanian language. By some it is thought to be the speech of the ancient Pelasgs, but Gustav Meyer and most of the later philologists believe it to be one of the eight chief Indo-Germanic groups, representing the ancient Illyrian; it is found not only in Albania, but in southern Italy and Sicily. The former notion that its affinities were prevailing Greek was derived from the number of Greek loan-words in its southern branch, the Toskish, the northern and the more primitive being called Gegish; the affiliation of the whole is rather to Slavic than any other. While retaining its grammatical structure, its vocabulary has been largely transformed by borrowing from its neighbors; Latin most, then Greek, Serbian and Turkish. The many suffixes of Latin origin, the simple and compound verbs made in accordance with Latin models, the formation of plurals by inflexion, etc., are the best proof that the Albanian language has been affected most by Latin influence. It has almost no literature, except folk songs, fables and tales. The Gegish use the Roman alphabet, the Toskish the Greek, with some changes, there being no common written alphabet. Apart from a few writings of the Roman Catholic propaganda (Varibabba with his 'Life of the Virgin Mary') mention should be made of de Rada's attempt to collect Albanian national poetry and rhapsodies (19th century). In the most recent times Koustauban Kristoforidhis has written a grammar of the Albanian languages and endeavored to translate the Old and New Testaments.

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Revised by WOISLAV M. PETROVITCH,
Chief Slavonic Division, New York Public Library.

ALBANS, St. See ST. ALBANS.

ALBANY, ăl'bā-ni, **Louisa Maria Caroline,** or **Aloysia,** COUNTESS OF, a princess of the Stolberg-Gedern family: b. 1753; d. 29 Jan. 1824. She married in 1772 the English pretender, Charles Edward Stuart, after which event she bore the above title. Her marriage was unfruitful and unhappy. To escape from the barbarity of her husband she retired in 1780 to a cloister and afterward to the house of her brother-in-law at Rome where she met the poet, Alfieri, to whom, soon after the death of her husband, she was privately married. Alfieri attributed to her his poetic inspiration. (See ALFIERI). She died at Florence, her usual place of residence, in her 72d year. Her ashes and those of Alfieri now repose under a common monument in the church of Santa Croce at Florence.

ALBANY, Ga., city and county-seat of Dougherty County, on the Albany & North Seaboard Air Line, Central Ga. and Plant System railroads, at the head of navigation on the Flint River, about 175 miles west from Savannah. The city has large manufacturing interests in lumber, cotton, bricks, etc., and is the centre of one of the most productive agricultural regions in the State. It is governed by a mayor and a council and maintains municipal

gas and electric lighting plants and waterworks. Pop. (1910) 8,190; (1916) 12,500.

ALBANY, Mo., city and county-seat of Gentry County, on the Chicago, B. & Q. Railway, about 82 miles northeast from Kansas City. The Central Christian College and the Northwest Missouri College are situated there. The city, first settled in 1845, is governed by a mayor and council. Pop. 2,000.

ALBANY, N. Y., State capital and seat of Albany County, on the right (west) bank of the Hudson, 143 miles north of New York, 200 miles west of Boston, 297 miles east of Buffalo. Besides its political importance as the capital, its commercial and manufacturing status is high. For many years the starting point of all the enormous eastern travel and traffic to the West, over the Erie Canal (q.v.), connecting it with the Great Lakes at Lake Erie, and now virtually the terminus of the new State Barge Canal System, it is an important port and the intersecting point of the great western as well as northern rail and water routes. With New York and the ocean it is connected by the imperial Hudson, of which it is the head of navigation for large steamers (smaller ones going on to Troy, six miles above). The Barge Canal is a great commercial advantage and will soon be more so; while the Champlain-Barge Canal gives access not only to western Vermont, but to the Saint Lawrence and the heart of Canada, with the foreign business centring at Montreal. It joins the western and northern traffic of the New York Central Railroad system (the Adirondack region, Vermont and Canada) and that of the Delaware & Hudson Railroad with the western traffic of central New England over the Boston & Albany branch of the New York Central road, the Fitchburg branch of the Boston & Maine Railroad and the Rutland Railroad.

Trade and Manufacturing.— The through freight lines now leave little transshipment to be done at Albany, but the city still remains an important passenger centre, and is the second largest express and the third largest mail transfer point in the United States. Commerce and industries are conservative and it retains much of both given it by its position in earlier times as a distributing point and terminal. In particular, the great Canadian and Adirondack forests to the north have made it an immense lumber port. Its manufactures are of wide and well-known importance, the greatest being iron goods,— foundries and stove works,— wood and brass; combined wood and metal, as carriages and wagons; brick, shirts, collars and cuffs, clothing and knit goods, shoes, flour, tobacco and cigars; and brewery products, billiard balls, dominoes, checkers and embossed blocks. The United States census (1914) reported 477 manufacturing establishments of factory grade, employing 11,405 persons, of whom 9,399 were wage-earners receiving a total of $5,652,000 in wages. The capital employed aggregated $26,683,000 and the value of the output $25,289,000; the value added by manufacture being $13,864,000. In addition there are also the extensive car and locomotive shops of the New York Central Railroad.

Finances.— The assessed valuation of real property in 1917 was $104,701,690 and the net public debt in 1910 was $2,458,644.08. The annual and municipal outlay is about $2,283,000, of which $492,286 was for schools, $244,885 for police and $250,610 for the fire department. There were four discount banks and trust companies with aggregate capital of $3,000,000, and seven savings banks with a surplus (at market value) of $4,621,941, and amount of deposits of $83,973,602. Tax rate (1917) per $100 was $2.56 (includes State, county and city taxes).

Interior.— The city has a river frontage of little over four miles and extends west about nine miles, from a narrow alluvial strip often flooded in the spring, over a steep rise to a sandy tableland 150 to 200 feet above tidewater, divided into four elevations and their corresponding valleys. It has 97.5 miles of streets, paved with granite, asphalt and brick; gas and electric light plants; and about 42 miles of electric street railways within its limits, several suburban lines running to towns at a distance, centring in Albany: these lines reach Troy, Cohoes, Saratoga, Glens Falls, Lake George and Warrensburgh in the north, a distance of 71 miles; Sand Lake in the northeast, a distance of 15 miles; Schenectady, Amsterdam, Johnstown and Gloversville in the west, a distance of 50 miles, and Hudson in the south, a distance of 38 miles. The river is crossed by two railroad and foot bridges and one wagon bridge to Rensselaer (formerly Greenbush). The water supply is partly taken by gravity from an artificial lake five miles west, and partly pumped from the river, with a public filtration system. This plant covers 20 acres of ground, has eight filter-beds and filters 15,000,000 gallons of water daily. The parks, 11 in number, contain 402 acres; the largest is Washington Park of 90 acres with a lake 1,700 feet long. This park contains the celebrated "Burns" statue by Charles Calverly, and the bronze and rock fountain "Moses at the Rock of Horeb," by J. Massey Rhind, and the Soldiers' and Sailors' Monument. The three cemeteries cover 440 acres. President Arthur's tomb is in the handsome Rural cemetery of 280 acres, situated four miles north of the city.

Buildings.— The great show building of Albany is the magnificent capitol, begun in 1871 and continued by several different architects at a total outlay to date of some $29,000,000. The lack of unity in plan makes itself perceptible both in looks and cost, millions have been spent in alterations and reconstructions, and some of the mechanical work and material have been poor. It is of Maine granite, in the Renaissance style; is 300 x 400 feet and covers more than three acres; it occupies a most sightly position on the hillside facing the river, and including part of the site of the old capitol built in 1806. Besides its rooms for the legislative bodies and officials and the court of appeals, it contains many interesting relics of the Revolution and Civil War. The grand western staircase in the western end of the building is said to be the finest staircase in the world. Fire nearly destroyed the building in 1911.

The State House and the City Hall face the capitol; the former of white marble and the latter of red sandstone with grand campaniles and Romanesque doorways. The custom-house and post-office are in the government building at the foot of State street. Among other

buildings are the County courthouse; the State armories; the old Schuyler Mansion, once used as an orphan asylum, but dedicated in 1917 as an historical monument; the Albany Institute and Historical and Art Society, containing many archives of Albany history; the Hotel Ten Eyck; the Delaware and Hudson building; and the new High School. In 1893 the second Van Rensselaer manor-house, built 1765, was removed to the Williams College campus, of Williamstown, Mass.

Religion, Education, Etc.— Albany is the seat of both Roman Catholic and Protestant Episcopal bishoprics, and has 74 churches. Very notable are the cathedrals of the Immaculate Conception (R. C.) and All Saints (P. E.). Saint Peter's Church (P. E.) is reputed one of the finest specimens of the French Gothic type of architecture in the United States. The Madison Avenue and First Reformed churches were organized in 1642, incorporated in 1720 and continued as one church until 1799, when separate edifices were built; these two churches continued under one government until 1815.

The State Education Building is exceedingly attractive, four stories and basement. The materials used on the front and ends are for the most part white marble, terra cotta and dark granite. The building contains offices for the Board of Regents and Department of Education, the State Library, with an attractive reading room, and a stock room capable of accommodating 2,000,000 volumes, the State Library School, and the State Museum, which contains the State collections in geology, mineralogy, paleontology, archæology, botany and zoology. There is also a large auditorium in the building. Several large and attractive mural paintings adorn the walls.

The public school property is valued at nearly $2,000,000. Other institutions of learning are the law and medical departments of the Union University at Schenectady (originally independent academies of 1851 and 1839), Albany Academy, the State College for Teachers, Saint Agnes School, the Albany Female Academy and the Convent of the Sacred Heart; also the Dudley Observatory and the Bender Hygienic Laboratory. Albany has a fine city hospital built in 1899 on the pavilion plan and covering 16 acres with 150,000 feet of floor space; the Homœpathic and Saint Peter's hospitals; the Albany penitentiary, dating from 1848 — from three to four hundred prisoners a year are confined in this institution.

Government.— Biennial mayor; city council, the president elected at large, the aldermen by wards; and boards constituted as follows: (1) Finance, comptroller, treasurer and a board of estimate composed of the mayor, comptroller, corporation counsel, president of the common council, city engineer and treasurer; (2) Public Works, commissioner who appoints superintendents of waterworks and parks; city engineer; a board of contract and supply; (3) Public Safety, commissioner who appoints chiefs of police and fire departments with their subordinates and a health officer with assistants; (4) Public Instruction, three commissioners of education, term six years, who appoint superintendent of schools and teachers; (5) Assessment and Taxation, four assessors, two elected every two years for a term of four years; (6) Charities and Correction, commissioner who appoints overseer of the poor and assistants; (7) Judiciary, one police court justice who holds office six years and three city court justices; (8) Law, corporation counsel, assistant and subordinates. Of these officials, the comptroller, treasurer, assessors and police and city court justices are elected. All others are appointed by the mayor.

Population.— (1800) 5,289, (1820) 12,630, (1840) 33,721, (1860) 62,367, (1880) 90,758, (1890) 94,923, (1900) 94,151, (1910) 100,253. (1917) 109,843.

History.— Albany, as an old frontier town and strategic post against the French settlements in the 18th century wars, is of much historic interest. Next to Jamestown, Va., and Saint Augustine, Fla., it was the oldest settlement in the Union; if the 13 colonies only are included, and Jamestown thrown out as deserted since 1676, it may perhaps be called the oldest with a continuous life, though its actual settlement as a residence is later than Plymouth. (For early discovery, see AMERICA; HUDSON; VERASSANO). About 1540 a French trading-post was set up there for a time. In 1614 the Dutch, following Hudson's lead, established a factory on Castle Island, called Fort Nassau, in 1617 removed to the mainland and called Beverwyck. The first settlers were 18 Walloon families (Huguenot refugees from Belgium — Peter Minuit, the first director-general of New Amsterdam, was a Walloon), and Fort Orange (Latinized Aurania) was built the same year near the present capitol. In 1626 a war with the Mohawks forced the temporary abandonment of the village. In 1629 Killian Van Rensselaer, having obtained from the Dutch government a large land-grant near by, colonized it with Dutch settlers and rented the land to them as patroon. (See ANTI-RENT WAR; PATROON). This, as always, ended in a chronic dispute over the extent of his legal rights and jurisdiction, which was not settled till after the ownership of the Dutch settlements was transferred by the English conquest to the Duke of York and Albany (later James II) after whom Fort Orange was renamed. In 1686 it received a city charter (its bi-centennial was celebrated in 1886) from Gov. Thomas Dongan; its first mayor (appointed by the governor, though the council was elected) was Peter Schuyler. The English settlers rapidly increased, but Albany was long a Dutch city. In the French and Indian wars it was a stockaded rendezvous, arsenal and hospital, the refuge of the border. In 1754 it was the meeting-place of the first Provincial Congress, which formed "a plan of a proposed union of the several colonies." (See ALBANY CONGRESS). In 1777 it was Burgoyne's objective point, where he was to meet the expeditions up the river and from Canada. After being for many years the occasional seat of State government, it became the permanent capital in 1797, the centennial of which it celebrated 6 Jan. 1897. Its rapid growth began with the opening of the Erie Canal in 1825, making it the terminal for western business. Within 35 years it had increased five-fold. In 1848 the city was partially destroyed by fire.

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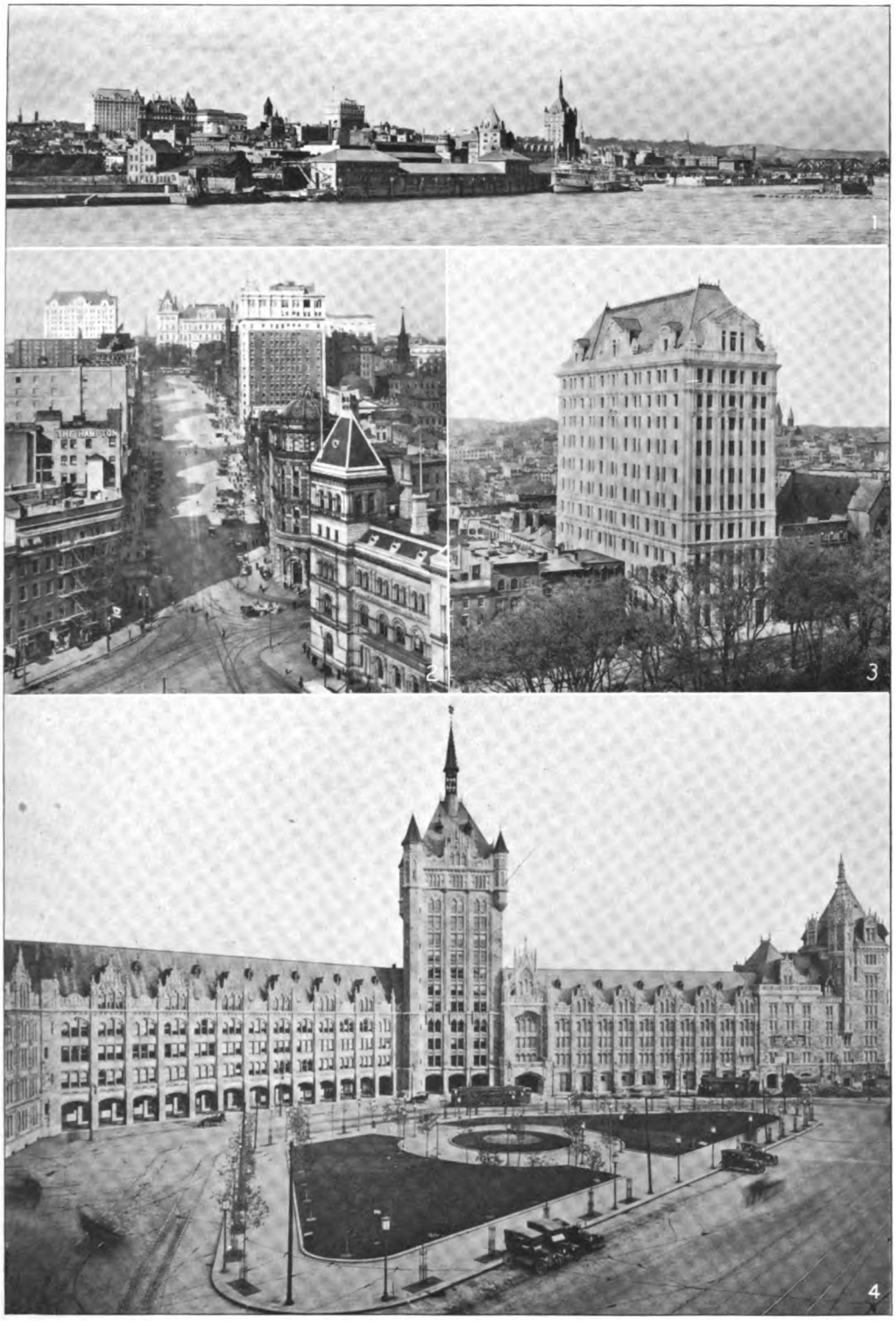
ALBANY, N. Y.



1 Albany from the River
(Fellowcrafts Photo. Copyright, 1917)
2 State Street from the Plaza
3 New York Telephone Company Building
4 Delaware & Hudson and Albany Journal Buildings

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EDWIN TRISTRAM COFFIN,
Secretary Albany Chamber of Commerce.

ALBANY, Ore., city and county-seat of Linn County, on the Southern Pacific and the Cowalli & E. railroads, and the Willamette River, about 25 miles south by west from Salem. The city has good water-power from the Willamette River, and has large manufacturing interests. It ships both grain and flour. Pop. (1916) 8,000.

ALBANY, West Australia, in Plantagenet County, on King George's Sound. It has one of the finest harbors in Australia and is a port of call for the steamers of the Peninsular & Oriental Company. It is a consular station of the United States. Pop. about 3,600.

ALBANY CONGRESS, an assembly of representatives of the seven northern British-American colonies (Massachusetts, New Hampshire, Connecticut, Rhode Island, New York, Pennsylvania and Maryland), called together in 1754 by the British government to consult in regard to the threatening French war. It met 19 June, and two plans were proposed: (1) A league with the Five Nations, which was carried out; (2) a proposal offered by Franklin for a political union. In this a common president was proposed, and a great council representing the different colonies. The president was to be appointed by the Crown; to be also commander-in-chief, to commission all civil officers and appoint all military ones and have a veto on the council. The council was to consist of three-year members, two to seven from each colony; not to be adjourned or dissolved or kept over six weeks in session against its will; it could lay taxes, maintain troops, build forts, nominate civil officers, manage Indian affairs and authorize new settlements; and its acts were to be valid unless vetoed within three years by the Crown. This plan was rejected by the British Crown because it gave too much power to the colonies and by the colonies because it gave too much power to the Crown. The significance of this congress lies in the fact that it stimulated the union of the colonies which was afterward accomplished.

ALBANY REGENCY, in American political history, the nickname of a powerful group of Democratic leaders in New York State, who controlled the party machinery there and acted together for influence in State and national affairs about 1820 to 1854. The name was given because the members of the Regency either lived near the capital or held offices which made the city their headquarters. Its origin and essence as an aristocracy of "bosses" lay in the system of frequent elections among a democracy, which puts nominations into the hands of professionals who will be paid in some shape, creating a permanent standing army of political managers. The Regency was the unofficial staff of this army and was larger than in other States from the imperial field which New York offered for great careers; but it could not have perpetuated its power but for the means of rewarding friends and punishing enemies given it by the "spoils system" (a name derived from the saying of one of its members, William L. Marcy, in 1833, that "to the victors belong the spoils"). While personally upright, and strong opponents of corruption, they held firmly to this, the very spring of corruption: the giving or taking away of offices, the use of public contracts for printing or other work or supplies, etc. That this was its cement is shown by the fact that after the bitter factional split of 1848 (see BARNBURNERS) had given the other party this patronage to use against it, the Regency was reduced in a few years to unorganized individuals. The members of course kept themselves in high or profitable positions according to their capacities or preferences; several alternating between State and national preferment, but never neglecting the former basis even in the latter service. The earliest and greatest leader was Martin Van Buren, State attorney-general, United States senator 1821–28, resigning to become governor of New York, Jackson's secretary of state, Vice-President, President. Others were William L. Marcy, State comptroller, judge of the New York supreme court, United States senator 1831, resigning 1833 to become governor of New York, Polk's secretary of war, Pierce's secretary of state; Silas Wright, congressman, State comptroller, United States senator 1833–44 (succeeding Marcy), resigning 1844 to become governor of New York; John A. Dix, State secretary of state, United States senator 1845–49, Buchanan's secretary of the treasury, again governor of New York 1872–74; Benjamin F. Butler, Van Buren's attorney-general and acting secretary of war; while others held only State offices,—Azariah C. Flagg, State secretary of state and afterward twice comptroller; Edwin Croswell, State printer, editor of the Albany *Argus,* leading Democratic organ; Benjamin Knower, State treasurer; and others held no offices,—Dean Richmond, Roger Skinner, Peter Cagger, Samuel A. Talcott, etc. Afterward Samuel J. Tilden, Daniel Manning and others of high stamp, by sagacity of central management, preserved in a manner the traditions of the older group, though they never had its patronage to use for discipline.

ALBATROSS (corrupted from Portug. *alcatroz,* the cormorant; from Ar. *al,* the; *qadus,* bucket, on account of its pouch), a large, almost exclusively pelagic bird of the family *Diomedeidæ,* a feature of the lonely southern oceans. They are rarely seen on the north Atlantic, but frequent nearly all other seas, and are never seen ashore except on the barren Antarctic islands where they breed. They have great powers of flight and follow ships for long distances to pick up offal. Their appetites are rapacious, their natural diet consisting of any fishes, mollusks or other animal matter which they find at the surface of the water; they do not dive. Sailors are fond of them and have a strong superstition against killing them. Like their allies, the petrels, the albatrosses have three fully-webbed toes, while the hind toe

is either entirely wanting or represented by a claw. The bill of an albatross is four inches or more long, very thick and finished by a powerful hook at the tip. The nostrils open from round horizontal tubes placed one on each side of the bill, but at its base, instead of together on top as with the petrel. The wings are extremely long and pointed, the tail short and somewhat rounded. The feathers of the body form so thick a coat as to withstand both water and severe, long-continued cold; owing to the extreme length of the wing the number of flight feathers on it is greater than on the wing of any other bird. The single large white egg of the albatross is usually hatched on the bare earth. Two rather small species of albatross, the short-tailed (*Diomedea albatrus*) and the black-footed (*Diomedea nigripes*), occur on the western coasts of North America; these are about three feet long and seven feet across the wings. The sooty albatross (*Phœbetria fuliginosa*), of much the same size, belongs broadly to the Pacific Ocean. There are from seven to nine other species, of which the largest is the wandering albatross (*Diomedea exulans*) of the southern oceans. It is four or five feet long and 10 to 12 feet from tip to tip of wings. Its color is white, with black bars across the wing coverts and across part of the back. This is probably the best known species in the family.

AL-BATTA'NI (MOHAMMED IBN JABIR IBN SINAN), Arab astronomer and mathematician: b. 850; d. 929. He began his astronomical observations at Rakka in 878 and continued them for over 40 years. In pure mathematics he also made important investigations. He used the sine of an angle instead of the chord of double the angle, computed a table of cotangents and formulated several propositions in spherical trigonometry. Plato of Tivoli translated his astronomical works under the title 'Mahometis Albatenii de Motu Stellarum.' This work made him known to Europeans. This work was edited by C. A. Nallino in Arabic and Latin and published at Milan (1899). Al-Battani corrected numerous errors of astronomers; he gave the length of the tropical year as 365 days, 5 hours, 46 minutes, 24 seconds; too short by 2 minutes, 26 seconds, and he stated the obliquity of the ecliptic as 23° 35′ instead of 23° 51′ 20″.

ALBAY, äl-bī, Philippine Islands, province in the southeast of Luzon, and the richest hemp-growing district on the island; area, 997 square miles; pop. 241,000. It has yielded as much as 40,000 tons of hemp in a season. The province contains a picturesque volcano, Mayon, which has had several destructive eruptions, the last in 1888. In January 1900 Brig.-Gen. William A. Kobbe, United States Volunteers, was appointed military governor of the province and Catanduanes Island, with temporary authority over Samar and Leyte Islands for the purpose of controlling the hemp-growing country and occupying and opening to trade the various hemp ports. The principal towns in the province are Albay (the capital, pop. 42,000), Tivi, Malinao, Tobaco, Malilipot, Bagacay, Libog, Legaspi, Manito, Libon, Polangui, Ligao, Oas, Guinobatan, Cagsaua and Camalig. Vicol is almost the exclusive language of the province. The industries are hemp-growing (annual value $4,750,217), shipbuilding, gold, silver, coal and iron mining.

ALBEMARLE, The, a Confederate ram, which for a long time did great damage among Union shipping, but was finally destroyed by W. B. Cushing (q.v.), who was entrusted at different times with various difficult feats of the sort. Cushing, while the *Albemarle* was at moorings in the harbor of Plymouth, N. C., on the night of 27 Oct. 1864 entered the harbor and succeeded in blowing up the vessel by means of a torpedo. The *Albemarle* was rendered completely useless, and Cushing obtained lieutenant-commander's rank and the thanks of Congress for his execution of the exploit.

ALBEMARLE SOUND, a shallow and narrow body of water on the coast of North Carolina, separated from the Atlantic Ocean by low sand islands. The greatest depth is about 18 feet, but it is generally so shallow as to be unnavigable except where it has been dredged. The water is generally fresh and is not affected by the tides. It extends directly west from the ocean about 60 miles. It is the outlet of many of the streams of northeastern North Carolina, chief of which are the Roanoke and Chowan.

ALBERONI, äl'bą-rō'nē, **Giulio**, cardinal and minister of the King of Spain: b. Firenznola, Parma, 1664; d. Rome 1752. He soon gained the favor of powerful patrons, especially the Duke of Vendôme, whom he accompanied to Paris and then to Spain, the Duke being appointed generalissimo of the armies of Philip V. Having made himself a favorite of the Spanish King, he rose to be prime minister, became a cardinal, was all-powerful in Spain after the year 1715 and endeavored to restore it to its ancient splendor. He reformed abuses, created a naval force, organized the Spanish army on the model of the French and rendered the kingdom of Spain more powerful than it had been since the time of Philip II.

ALBERS, Petrus Henricus, German ecclesiastical historian: b. Cranenburg, Cleves, Germany, 13 April 1856. He was educated at the gymnasium of Gemert, North Brabant; emigrated with his family to Holland in 1870 and entered the Society of Jesus in 1880. After completing his studies in the Jesuit scholasticates he took a course in church history at Innsbruck under Ludwig Pastor. In 1896 he became professor of church history at the Jesuit college of Maastricht. He is a member of the Historical Society of Utrecht, the Leyden Literary Society and of the administrative board of the Historical and Archæological Society of the Province of Limburg. He has published: 'Het Herstel der Hierarchie in de Nederlanden' (2 vols., Nijmegen 1904); 'Handboek der Algemeene Kerkgeschiedenis' (2 vols., ib., 1905–07), translated into French, Latin, Spanish, Italian and English; 'Levensgeschiedenis van Pater Roothaan.' He was a collaborator in 'Vivat's Encyclopédie'; 'Nederlandsch Biographisch Woordenboek'; 'Het Jaarboekje van Alberdingk Thijm'; and 'Archief voor de Geschiedenis van het Aartsbisdom Utrecht'; and for many years has been a contributor to the *Studien*.

ALBERT, Prince (ALBERT-FRANCIS-AUGUSTUS-CHARLES-EMMANUEL), Prince of Saxe-Coburg-Gotha and Prince Consort of England, second son of Ernest I, Duke of Saxe-Coburg, was born at the Rosenau, a castle near Coburg,

on 26 Aug. 1819. In 1837 he entered the University of Bonn, where he devoted himself to the studies of political and natural science, history, philosophy, etc., as well as to those of music and painting. On leaving the university he made a tour through the chief cities of Italy with Baron Stockmar. On 10 Feb. 1840 he married his cousin, Queen Victoria of England. An allowance of £30,000 a year was settled upon the Prince, who was naturalized by act of Parliament, received the title of Royal Highness by patent, was made a field-marshal, a Knight of the Garter, of the Bath, etc. Other honors were subsequently bestowed upon him, the chief of which was the title of Prince Consort (1857). He always took a deep and active interest in the welfare of the people in general. His services to the cause of science and art were very important; he presided over the commission appointed in 1841 to consider the best means of rebuilding the houses of Parliament and the great exhibition of 1851 owed much of its success to his activity, knowledge and judgment. He died of typhoid fever on 14 Dec. 1861, after a short illness. A collection of his speeches and addresses was published in 1862. A biography of the Prince by Sir Theodore Martin has been published in five volumes (London 1875–80).

ALBERT I, King of the Belgians: Albert Leopold Clément Marie Meinrad, Duke of Saxony, Prince of Saxe-Coburg and Gotha, second son of Prince Philip Baldwin, Count of Flanders, and Princess Marie of Hohenzollern: b. Brussels, 8 April 1875; married 2 Oct. 1900 to Elizabeth, Duchess of (in) Bavaria, daughter of the late Duke Karl Theodor, the physician and oculist. They have three children: (1) Prince Leopold, Duke of Brabant, b. 3 Nov. 1901; (2) Prince Charles, Count of Flanders, b. 10 Oct. 1903; (3) Princess Marie José, b. 4 Aug. 1906.

King Albert succeeded his uncle, Leopold II (d. 17 Dec. 1909) and was crowned on 23 Dec. 1909. The condition of Belgium at that time was far from promising. Leopold II had gone to his grave "unwept, unhonour'd and unsung." His profligate vices, ambitions and autocratic magnificence, his domestic tyranny and private scandals had aroused almost universal indignation, nowhere stronger than in his own country. In addition, the Kongo atrocities perpetrated in his name and with his knowledge had lowered the repute of Belgium. Hence the new King inherited sentiments of distrust, enmity and anger at home and abroad, besides a country saddled with enormous expenditures. A barrier of estrangement and contempt had grown up between King and people; it was the task of Albert I to break down that barrier and replace it by a bond of democratic sympathy and confidence. Like his uncle, he is a man of great stature and masterful will; but there the resemblance ends. Before he had been two weeks on the throne his people realized that something essential had been changed in Belgium; that the "commonplace virtues" so constantly disregarded by the late King — love of children, of family and country, honesty and simplicity — had been restored, as it were by magic, into the scheme of national life. One of the King's actions was to allow — or rather, invite — Princess Louise, Leopold's eldest daughter, to return to Belgium, whence her father's wrath had expelled her. He also authorized Leopold's youngest daughter, Princess Clementine, to marry Prince Victor Napoleon — a love romance which her father had sternly opposed. King Albert quickly gave proof of his genuine interest in the welfare of the people, in their labor and their pleasures; in the sympathetic encouragement he extended to art, literature, science and industry — all subjects treated with contemptuous indifference by his predecessor. He reduced the royal court ceremonials and etiquette to their lowest expression; with his consort he moved among his people with an easy, unpretentious friendliness, qualified by a natural modesty almost akin to bashfulness. He abolished Leopold's custom of driving through the streets surrounded by loaded rifles and pistols. The success of his endeavors to win public confidence was not, however, the result of mere tactful good nature, but of deep understanding, systematic study and first-hand knowledge. He had been trained in sociology and economics by his father; as heir presumptive for 18 years (since the death of his elder brother in 1891) he strove to learn facts for himself regarding the life and labor of the people. With this object he worked in the mines, drove railway engines and generally mixed with the working classes in all their activities. In the guise of a newspaper reporter he had visited the principal ports and shipyards of Europe, and in 1898 traveled in the United States. where he made a study of our railroad methods with the assistance of the late James J. Hill. Some months before his accession he returned from an extensive tour through the Belgian Kongo and plainly opened his mind on the necessity for reforms to his royal uncle, who, it is said, never spoke to him again.

On his accession King Albert ordered the release of 2,500 prisoners detained for minor offenses. He attended the funeral of King Edward in London (May 1910) and a week later with the Queen was in Berlin and Potsdam, receiving expressions of the good-will of the German people and their ruler. As the Kaiser was indisposed at the time, the Imperial Crown Prince acted as host. In the official speeches peculiar stress was laid on the commercial relations between the two countries and the absence of any desire on the part of Germany to annex Belgium. On 25 Oct. 1910 the German Emperor and Empress and their daughter visited Brussels. At the state banquet that night the Emperor, replying to the King's French speech, spoke in German — which few of those present understood — and said, in conclusion, ". . . that your Majesty's reign may spread happiness and prosperity in your Royal House and among your people, is the wish which arises from the deepest depth of my heart, and with which I cry, Long live the King and Queen of the Belgians. Hurrah!"

Long before he was called to the throne, King Albert had resolved to remedy a serious defect in the equipment of his country: Belgium had a great overseas trade and the second port in Europe, namely, Antwerp; but its merchandise was carried in foreign ships, mainly English and German, not only a source of commercial weakness, but also a political menace. The Germans were gradually acquiring a predominant influence in Antwerp, capturing the chamber of commerce, the marine insurance business, the

control of the banks, possession of the navigation companies, ship-broking, etc., etc. To alter this he had decided on a Belgian mercantile marine and during the first year of his reign a shipping scheme was put forward, by which a new service to South America and one to the Kongo were established with a capital of $2,000,000, of which $800,000 was supplied by the Woermann Line of Hamburg and the British Elder-Dempster Company. In 1911 two new steamer services were started to Brazil — from Ghent to Rio Grande do Sul and from Antwerp to Brazilian and River Plate ports. Despite labor troubles, election riots and political strife, King Albert and his government introduced a number of useful reforms, including free and compulsory education, equal rights for the Flemish and French languages, and a scheme for the reorganization of the army.

The great world conflict turned the eyes of the world upon the little kingdom and its monarch; the tragedy of Belgium became the central star in a lurid constellation of tragedies. In a few days Albert I was a king without a country. Only four and a half years earlier he had uttered these words in Brussels: «Belgium is mistress of her destiny. . . . Belgium is rich and happy. . . .» Perhaps the first vision of coming disaster was conveyed to King Albert as early as November 1913, by no less a person than the German Emperor himself, in an interview at which von Moltke, chief of the General Staff, was also present. The report of that interview first saw the light in the French Yellow Book published in December 1914 (see WAR, EUROPEAN — DIPLOMATIC HISTORY). Thus the year before the war King Albert knew that the storm would ere long burst over his country, for von Moltke had prophesied to him the «irresistible enthusiasm with which the whole German people will be carried away when that day comes.» Though he had no passion for military glory, though all his hopes centred in the commercial and industrial development of his country, King Albert unhesitatingly rejected the German demand for a free passage through Belgium and mustered his forces to resist invasion. He had studied the art of war with the same thoroughness that he gave to all his tasks; his own military training began at the age of 17. Unfortunately, the army reorganization was barely half completed when the challenge came. German troops were already on Belgian soil when he made a «supreme appeal» for the diplomatic intervention of Great Britain. At 7 o'clock the same night the British ambassador in Berlin presented the ultimatum. The heroism of the Belgians and their King was not in vain; their spirited resistance held the avalanche long enough to enable the French and British to complete their mobilization and preparations for the victory of the Marne. After the fall of Antwerp the Belgian government withdrew to Le Havre, France (13 Oct. 1914). During the war Albert shared all the dangers of the field with his heroic army, defending the remnant of his kingdom, a corner of West Flanders. See WAR, EUROPEAN.

ALBERT, First Duke of Prussia, and the last Grand Master of the Teutonic Order, son of Frederick, Margrave of Ansbach and Baireuth, and grandson of Albert Achilles, Elector of Brandenburg: b. 17 May 1490; d. 20 March 1568. He was educated under the care of Archbishop Hermann of Cologne. He accompanied Maximilian I in his expedition against Venice. In 1511 he was chosen by the Teutonic Knights grand master of their order. Being the son of Sophia, the sister of Sigismund, King of Poland, and descended from one of the most powerful German families, the Knights hoped by his means to be freed from the feudal superiority of Poland and placed under the protection of the empire. Being recognized by Poland he proceeded to Königsberg and assumed the government in 1512. He refused the oath of allegiance to Poland, which the previous grand master had evaded, and prepared for resistance. In 1520, after protracted negotiations, Sigismund attempted to enforce submission by an invasion of the territories of the order, but the contest was without decisive result and in the following year a truce of four years was agreed to at Thorn. Albert appeared before the Imperial Diet at Nuremberg as a German prince of the empire to solicit the aid of the other princes in his struggle against the Poles. He failed in this object and soon after espoused the cause of the Reformation. In order to preserve his possessions from becoming a prey to Poland, he, at Luther's advice, had himself proclaimed secular Duke of Prussia and placed himself under the sovereignty of Sigismund. He earnestly sought to promote the welfare of his duchy, established the ducal library, founded the University of Königsberg in 1544 and gathered about his person many literary men. In 1527 he married Dorothea, daughter of Frederick, King of Denmark. The latter years of his reign were troubled with many intrigues, foreign and domestic; in 1532 he was put under the ban of the empire, but succeeded in transmitting his succession to his son. Consult Lohmeyer, 'Herzog Albrecht von Preussen' (Dantzic 1890) and Tschakert, 'Herzog Albrecht von Preussen' (Halle 1894).

ALBERT I, Margrave of Brandenburg, surnamed the Bear, from his heraldic emblem, was the son of Otto the Rich, Count of Ballenstädt; d. 1170. As Marquis of Lusatia he served the Emperor Lothaire with credit in his war with Bohemia. The Diet afterward withdrew Lusatia from him, but the Emperor for further services conferred on him in 1134 the margravate of Brandenburg. In 1136–37 he made incursions into the territory of the Wends, who disturbed his government, and checked their disorders. In 1138 the Emperor Conrad conferred on him the duchy of Saxony, of which he had deprived Henry the Proud. This led to a war with Henry, in which Albert was deprived of Brandenburg, but was restored by an armistice negotiated by the ecclesiastical electors. On the death of Henry (1139) he reassumed the title of Duke of Saxony. A combination was then formed against him, which, in spite of the favor of the Emperor, reduced him to extremities. Peace was concluded in 1142. Albert resigned Saxony and Brandenburg was raised to an immediate fief of the empire. He acquired at the same time by inheritance from Przibislas, a Vandal king who had taken his name in baptism, the country between the Elbe and the Oder. He made his new possessions a fief of the empire and in order the better to guard them removed his residence to Brandenburg.

ALBERT, KING OF BELGIUM

In 1148 he led an expedition into Pomerania and in the following year induced the duke of that country to embrace Christianity. In 1150 he was raised to the electoral dignity. In 1157 he made a third expedition against the Wends, conquered their country and colonized it with agriculturists from Germany, Holland and Zealand. In 1164 he went on a crusade to the Holy Land. Another war broke out between him and Henry, Duke of Saxony, which was terminated to the advantage of the latter in 1168 by the mediation of the Emperor Frederick I. In 1169 Albert remitted his estates to his son. The origin of Berlin, Köln, Aachen on the Elbe and other towns is attributed to the colonies founded by him. Consult Heinemann, 'Albrecht der Bär' (Darmstadt 1864).

ALBERT I, Duke of Austria, and afterward Emperor of Germany: b. 1248; d. 1 May 1308; son of Rudolph of Hapsburg, who had a short time before his death attempted to place the crown on the head of his son. But the electors, tired of his power and emboldened by his age and infirmities, refused his request and indefinitely postponed the election of a King of the Romans (the title of the designated successor of the Emperor). After the death of Rudolph, Albert, who inherited only the military qualities of his father, saw his hereditary possessions, Austria and Styria, rise up in rebellion against him. He quelled by force this revolt which his avarice and severity had excited; but success increased his presumption. He wished to succeed Rudolph in all his dignities, and without waiting for the decision of the Diet seized the insignia of the empire. This act of violence induced the electors to choose Adolphus of Nassau Emperor. The disturbances which had broken out against him in Switzerland, and a disease which deprived him of an eye, made him more humble. He delivered up the insignia and took the oath of allegiance to the new Emperor. Adolphus, after a reign of six years, lost the regard of all the princes of the empire, and Albert was elected to succeed him. A battle ensued near Gellheim, in which Adolphus fell by the hand of his adversary. The last barrier had fallen between Albert and the supreme power, but he was conscious of having now an opportunity of displaying his magnanimity. He voluntarily resigned the crown conferred on him by the last election, and as he had anticipated was re-elected. His coronation took place at Aix-la-Chapelle in August 1298, and he held his first Diet at Nuremberg with the utmost splendor.

But a new storm was gathering over him. The Pope, Boniface VIII, denied the right of the electors to deprive Adolphus of the imperial dignity and bestow it upon one who had caused the death of the legitimate sovereign. He accordingly summoned Albert before him to ask pardon and submit to such penance as he should dictate; he forbade the princes to acknowledge him and released them from their oath of allegiance. The archbishop of Mainz from a friend became the enemy of Albert and joined the party of the Pope. On the other hand, Albert formed an alliance with Philip le Bel of France, secured the neutrality of Saxony and Brandenburg, and by a sudden irruption into the electorate of Mainz forced the archbishop not only to renounce his alliance with the Pope, but to form one with him for the five ensuing years. In April 1301 Boniface forbade all submission to Albert until he would go to Rome and repair his crimes. The next year Albert entered into negotiations with the Pope, in which he again showed the duplicity of his character. He broke his alliance with Philip, acknowledged that the Western Empire was a grant from the Popes to the emperors, that the electors derived their right of choosing from the see of Rome and promised to defend with arms the rights of the Pope whenever he should demand it, against any one. As a reward Boniface excommunicated Philip, proclaimed him to have forfeited his crown and gave the kingdom of France to Albert. Philip in revenge annoyed and persecuted the Pope.

Albert was engaged in unsuccessful wars with Holland, Zealand, Friesland, Hungary, Bohemia and Thuringia. While preparing to revenge a defeat which he had suffered in Thuringia he received the news of the revolt of the Swiss and saw himself obliged to direct his forces thither. The revolt of Unterwalden, Schwyz and Uri had broken out 1 Jan. 1308. Albert had not only foreseen this consequence of his oppression but desired it, in order to have a pretense for subjugating Switzerland entirely to himself. A new act of injustice, however, put an end to his ambition and life. Suabia was the inheritance of John, the son of his younger brother Rudolph. John had repeatedly asserted his right to it, but in vain. When Albert set out for Switzerland John renewed his demand, which was contemptuously rejected by Albert. John, in revenge, conspired with his governor, Walter of Eschenbach, and three friends against the life of Albert. The conspirators took advantage of the moment when the Emperor, on his way to Rheinfelden, was separated from his train by the river Reuss, and assassinated him.

ALBERT, Peter Paul, German archivist: b. Steinbach, Baden, 29 Jan. 1862. He was educated at the universities of Freiburg, Würzburg and Munich. In 1899–93 he was assistant archivist of the Grand-Ducal General Public Archives in Karlsruhe and in 1897 became archivist at Freiburg-im-Breisgau. He is a member of the Baden Historical Commission and has published: 'Matthias Döring' (1889); 'Geschichte der Stadt Radolfzell' (1896); 'Steinbach b. Mudan' (1899); 'Baden Zwischen Neckar und Main' (1901); 'Die Geschichtschreibung der Stadt Freiburg' (1912); 'Schloss Burgheim am Rhein' (1904); 'Die Schiller von Herdern' (1905); 'Die Odenwaldbahn Mosbach-Mudan' (1906); 'Die Schneeburg ob Ebringen' (1909); 'Der Meister E. S.' (1910). He is editor of the *Freiburger Münsterblätter* and the *Freiburger Zeitschrift für Geschichte—Altertums-und Volkskunde.*

ALBERT. See ANCRE.

ALBERT COAL. See ALBERTITE.

ALBERT LEA, Minn., county-seat of Freeborn County, on the Chicago, M. & St. P., the Burlington, C. R. & N. and the Minneapolis & St. L. railroads, about 100 miles south of St. Paul and 10 miles north of the boundary of Iowa. The presence of many lakes and ar-

tesian wells of chalybeate waters make the city and neighborhood a popular summer resort. It is the market town for a large agricultural and dairy region, is noted for its State creamery and has considerable manufacturing interests. It is the seat of a Presbyterian college for women and a Lutheran Academy. Pop. (1910) 6,192; (1916) 12,000.

ALBERTA, ăl-bŭr'tą, Canada, a northwestern province. A part of the present area of the province was in 1882 given territorial status and called Alberta in honor of H. R. H. Princess Louise Caroline Alberta, daughter of Queen Victoria and wife of the Marquis of Lorne, 9th Duke of Argyle, at that time Governor-General of Canada. The country was sparsely settled, what white population there was being chiefly in the south and engaged in ranching. For upwards of 15 years little change took place, but subsequent to 1896 a vigorous immigration policy was instituted and settlers flowed in. By the autonomy acts of 1905 the old territories stretching from the western boundary of Manitoba to the Rockies were erected into the two provinces of Saskatchewan and Alberta. The boundaries given to the latter were the 49th parallel — the United States frontier — to the south, the 60th parallel to the north, the 4th meridian to the east and British Columbia to the west. This vast area of 253,540 square miles is 750 miles from north to south and at its broadest part 400 miles from east to west. Though somewhat smaller than Texas, Alberta is more than twice the size of Great Britain and Ireland and considerably more extensive than France or Germany.

Physical Features.— Alberta is a vast plateau ranging from 1,000 to 3,500 feet above sea-level. The land lies higher in the south and falls away toward the north. The country is well watered, both the great Mackenzie and Saskatchewan river systems taking their rise within the province. The Saskatchewan system, with its north and south branches, drains Alberta approximately from the Edmonton district to the American boundary, while the northern half of the province is watered by the various rivers which ultimately combine to make up the Mackenzie. The chief streams flowing into the south branch of the Saskatchewan are the Belly, Old Man, Saint Mary's, Bow and Red Deer, while into the north branch debouch the Clearwater, the Battle, the Sturgeon, the Vermilion and other smaller streams. The northern section of the province is drained by three great waterways, the Athabasca, Peace and Hay, which, united on issuing from Great Slave Lake, become the Mackenzie. Lakes also abound, especially in the northerly part of the province. Among the more important of these may be mentioned Gull, Buffalo, Wabamun, Saint Anne, La Biche, Claire and Lesser Slave Lake. Some of these are considerable bodies of water. Claire and Lesser Slave cover respectively 405 and 480 square miles and Lake La Biche has an area of over 100 square miles. Most of these lakes teem with fish — the whitefish of the northern lakes being much esteemed as an article of diet. Mention should be made of two small lakes that enjoy a world-wide reputation for beauty — Lake Louise in the Bow Pass through the Rockies and Lake Maligne in the Yellowhead Pass. While the southern part of the province is characterized by vast treeless prairies, the central section has been aptly described as a park-like country, prairie and wooded districts being intermingled. As one goes farther north, prairie again becomes predominant.

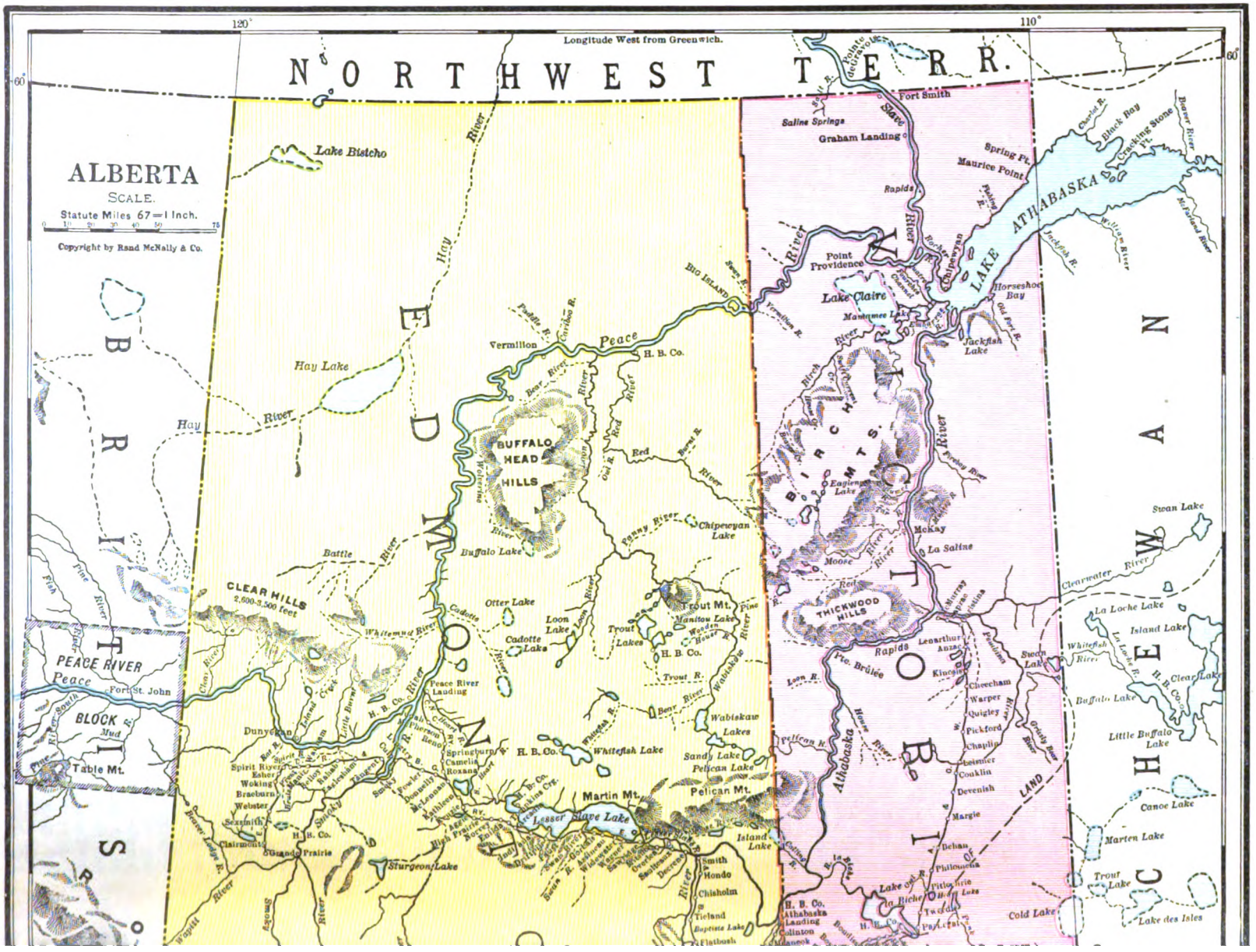
Climate.— Alberta has a continental climate, warm in summer and cold in winter. In the former season the thermometer frequently registers 90° during the daytime, but the nights are always cool. The distribution of heat varies little as regards latitude. At Fort Vermilion (lat. 58° 29′) the mean summer temperature is 61°; at Dunvegan (lat. 55° 56′) 60°; at Edmonton (lat. 53° 33′) 61°; at Calgary (lat. 51° 2′) and Cardston (lat. 49° 12′) 59°. This equality of heat seems the more extraordinary when it is remembered that Fort Vermilion and Cardston with two degrees difference in mean summer temperature are in a northerly and southerly direction roughly 700 miles apart. It may be pointed out in this connection that owing to its northerly latitude the summer days are very long in Alberta. These are accompanied with a correspondingly large amount of sunshine, which facilitates the rapid growth of field crops and vegetation of all kinds. At midsummer there are 18 hours of sunshine. In winter the weather is cold, but as the atmosphere, owing to the altitude, is dry, low temperatures are easily supported. In southern Alberta the winters are much modified by the warm chinook winds which, crossing the mountains from the Pacific, bring in their train periods of extremely mild and genial weather. Alberta is a region of light rainfall. The subjoined table indicates the average precipitation in the various months:

January,	1.03	May,	3.85	September,	.80
February,	1.03	June,	3.06	October,	1.24
March,	.92	July,	5.23	November,	1 74
April,	2.05	August,	1.73	December,	1.03

Though the foregoing figures yield only 23.71 inches for the year, it will be noted that of this total 13.87 inches or 58 per cent comes during the growing season and the crops are thus amply supplied with necessary moisture when it is most needed. In the southern portion of the province snow falls during the winter but soon disappears; in the more northerly section the snowfall varies in depth from six to 18 inches and remains on the ground from the beginning of December till the end of March.

Soil.— The soil of Alberta consists, generally speaking, of a marly clay subsoil overlaid with a black or chocolate-colored mould. The latter, the product of ages of decayed vegetable matter, varies from six inches to several feet in depth. The combination results in a soil capable of storing moisture and at the same time of extraordinary fertility.

Industries.— The chief industry is agriculture. The immense crops returned by the virgin land of Alberta have too often caused the farmer to devote himself exclusively to grain growing and to neglect stock. With the establishment, however, of extensive packing plants and resultant steady markets, increased interest is being taken in mixed farming, for which Alberta is admirably fitted. The area under crop and the production of cereals are


Longitude West from Greenwich.
120°
110°
60°
NORTHWEST TERR.
ALBERTA
SCALE.
Statute Miles 67 = 1 Inch.
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Lake Bistcho
Hay River
Hay Lake
Hay River
Peace River
Vermilion
H. B. Co.
Bear River
Red River
Buffalo Head Hills
Buffalo Lake
Battle River
Chipewyan Lake
Clear Hills
2,600-3,500 feet
Otter Lake
Cadotte Lake
Loon Lake
Trout Lakes
Trout Mt.
Manitou Lake
Wabiskaw River
Whitemud River
Peace River Landing
Dunvegan
Spirit River
Esher
Woking
Bracburn
Webster
Sexsmith
Clairmont
Grande Prairie
Sturgeon Lake
Springburn
Camelia
Roxana
Whitefish Lake
Wabiskaw Lakes
Sandy Lake
Pelican Lake
Pelican Mt.
Martin Mt.
Lesser Slave Lake
Island Lake
Smith
Hondo
Chisholm
Tieland
Baptiste Lake
Flatbush
Peace River
Fort St. John
Table Mt.
Block Mud
Fort Smith
Saline Springs
Graham Landing
Spring Ft.
Maurice Point
Rapids
Point Providence
Lake Claire
Mamawee Lake
Jackfish Lake
Horseshoe Bay
Big Island
Birch Mts.
Eagle Nest Lake
Mckay
La Saline
Moose River
Thickwood Hills
Pte. Brûlée
Athabaska River
Athabaska Landing
Lake of the Rich
Cold Lake
Lake des Isles
Trout Lake
Marten Lake
Canoe Lake
Little Buffalo Lake
Buffalo Lake
Clearwater River
La Loche Lake
Island Lake
Swan Lake
Beaver River
Black Bay
Cracking Stone Pt.
Chipewyan
Athabaska
Slave River
Peace River
Hay River
Vermilion R.
Caribou R.
Paddle R.
Red R.
Old R.
Pelican R.
Loon R.
Whitefish R.
Wabiskaw R.
Trout R.
Pine River
Clear River
Whitemud R.
Battle River
Fish River
Beaver Lodge R.
Wapiti River
Smoky River
Sturgeon River
Notikewin R.
Hotchkiss R.
Iosegun River
Simonette R.
Little Smoky R.
Saskatoon Cr.
Dunvegan
Spirit River
Esher
Woking
Bracburn
Webster
Sexsmith
Clairmont
Grande Prairie
Sturgeon Lake
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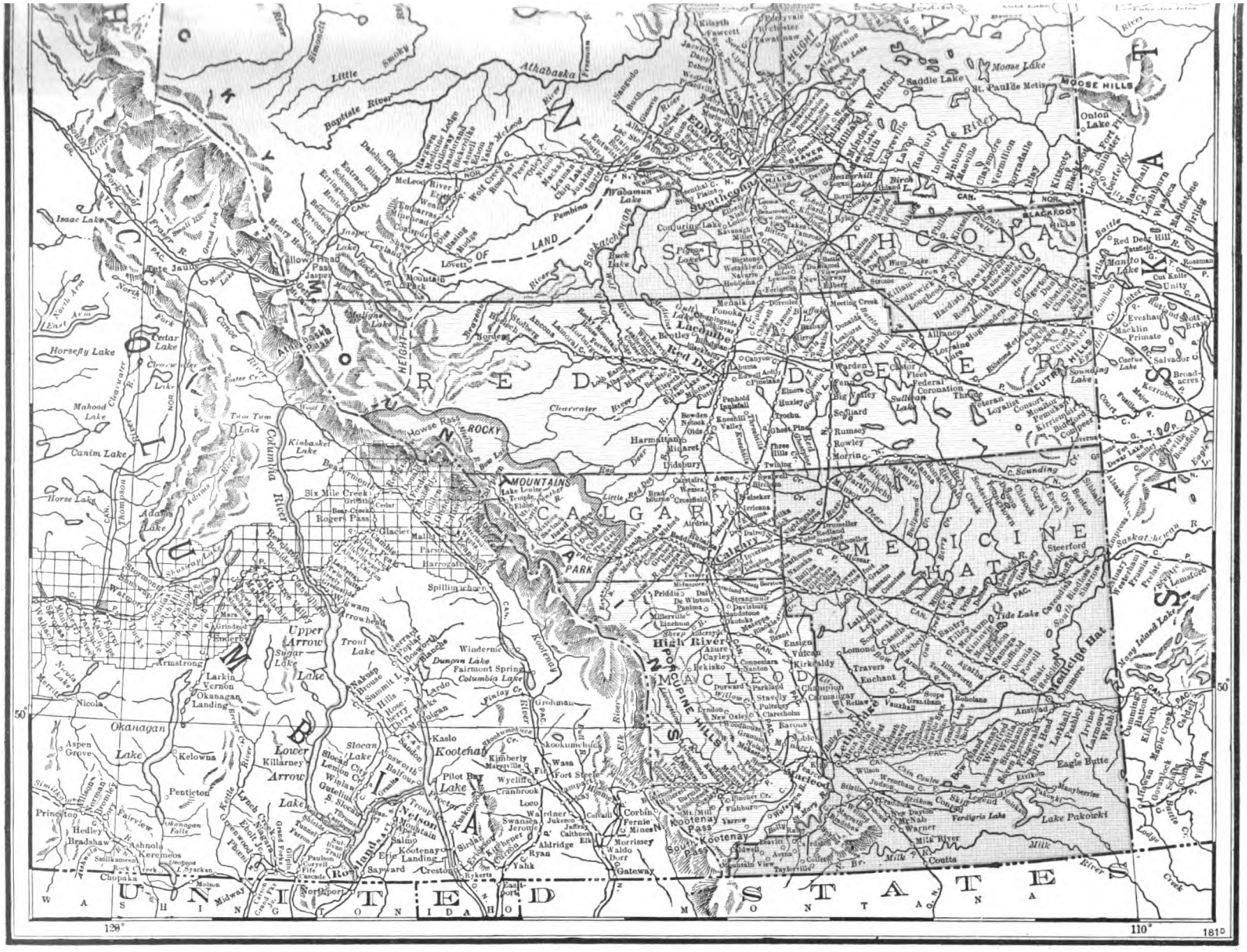
Hotchkiss R.
Iosegun River
Simonette R.
Little Smoky R.
Saskatoon Cr.


CALGARY
EDMONTON
MEDICINE HAT
LETHBRIDGE
MACLEOD
RED DEER
STRATHCONA
ATHABASKA
BOW RIVER
KOOTENAY
YELLOWHEAD
COLUMBIA
ROCKY MOUNTAINS
CANADIAN NATIONAL PARK
Athabaska River
Saskatchewan R.
Bow River
Red Deer River
Milk River
Kootenay Lake
Okanagan Lake
Columbia River
Kootenay Pass
Crowsnest Pass
Yellowhead Pass
Rogers Pass
Boundary of Land
Continental Divide
Moose Hills
Cypress Hills
Porcupine Hills
Sweetgrass Hills
Blackfoot Hills
Eagle Hills
Neutral Hills
Lake Pakowki
Verdigris Lake
Many Island Lake
Tide Lake
Gleichen Hat
Onion Lake
Saddle Lake
Moose Lake
Lac La Biche
Wabamun Lake
Pembina
Jasper
Banff
Lake Louise
Field
Golden
Revelstoke
Glacier
Mount Robson Park
Waterton Lakes
Crowsnest
Fernie
Cranbrook
Kimberly
Nelson
Trail
Rossland
Grand Forks
Penticton
Kelowna
Vernon
Armstrong
Revelstoke
Salmo
Creston
Sandon
Slocan
Kaslo
Nakusp
Arrowhead
Upper Arrow Lake
Lower Arrow Lake
Pilot Bay
Duncan Lake
Fairmont Springs
Columbia Lake
Windermere
Invermere
Golden
Field
Lake Louise
Banff
Canmore
Exshaw
Morley
Cochrane
Airdrie
Crossfield
Didsbury
Olds
Innisfail
Red Deer
Lacombe
Ponoka
Wetaskiwin
Leduc
Edmonton
St. Albert
Fort Saskatchewan
Vegreville
Lloydminster
Wainwright
Provost
Alliance
Hughenden
Consort
Coronation
Three Hills
Drumheller
Hanna
Oyen
Empress
Brooks
Bassano
Gleichen
Strathmore
High River
Okotoks
Turner Valley
Black Diamond
Claresholm
Nanton
Vulcan
Taber
Coaldale
Lethbridge
Fort Macleod
Pincher Creek
Cardston
Raymond
Magrath
Milk River
Coutts
Sweetgrass
Foremost
Cypress Hills
Medicine Hat
Redcliff
Bow Island
Suffield
Onefour
Manyberries
Eagle Butte
Irvine
Dunmore
Walsh
Elkwater
Maple Creek
Eastend
Swift Current
Gull Lake
Shaunavon
Frontier
Climax
Whitemud
Eastern Irrigation District
Western Irrigation District
Canadian Pacific Railway
Canadian Northern Railway
Grand Trunk Pacific Railway
Alberta Railway & Irrigation Co.
Great Northern Railway
Northern Pacific Railway
Kettle River
Similkameen River
Okanagan Landing
Kamloops
Merritt
Princeton
Hedley
Keremeos
Osoyoos
Oliver
Midway
Greenwood
Grand Forks
Rock Creek
Chopaka
Nicola
Aspen Grove
Okanagan
Lower Arrow Lake
Slocan Lake
Kootenay Lake
Pilot Bay
Nelson
Trail
Rossland
Salmo
Creston
Sandon
Kaslo
Nakusp
Arrowhead
Revelstoke

annually rapidly increasing. In 1900 the acreage of spring and autumn wheat was 30,361 and the product 583,806 bushels; in 1905 the acreage was 107,527 and the product 2,306,524 bushels; in 1910 the acreage was 592,960 and the product 7,904,520 bushels; in 1915 the acreage was 1,669,076 and the product 60,088,689 bushels. In 1900 the oat crop amounted to 2,625,581 bushels; in 1905 the return was 9,514,180 bushels; in 1910 the yield rose to 12,158,530 bushels and in 1915 with an acreage of 1,570,596 sown to oats the harvest totalled 90,582,694 bushels, averaging 57.66 bushels to the acre. The acreage of barley in 1915 was 374,062, and from this area 12,761,187 bushels were garnered. Flax in 1915 amounted to 569,762 bushels, the land under crop being 41,243 acres. In 1915 there were in the province 183,974 milch cows and 660,000 other cattle. Dairy farming is rapidly on the increase and excellent markets, both domestic and export, have been developed for dairy products. The production of butter for the year ending October 1915 was 7,200,000 pounds, an increase of 2,000,000 pounds over the previous year. Much attention has been paid to the breeding of horses and with the introduction of such standard strains as the Clydesdale, Percheron, Hackney, Shire, Suffolk and Belgian the standard of horseflesh has reached a high pitch. In 1915 there were 544,772 horses in Alberta. The growing of sheep, both for slaughter and for the wool crop, has proved profitable. The number of sheep in 1915 in Alberta was 238,579. The raising of swine has also in recent years yielded handsome returns. Extensive packing plants affording steady markets are in operation in Edmonton and Calgary.

As has been said, the bulk of the precipitation in Alberta comes at the growing time and provides ample moisture to mature the crops. This remark applies to by far the greater part of the province, but there is a dry area in the southern section — particularly the region lying between the cities of Medicine Hat and Calgary and Lethbridge. The situation in regard to this section is, not that there is always inadequate rainfall, but that the rainfall cannot confidently be depended upon and recourse has been had to irrigation schemes as a species of insurance so that the farmer may be always sure of his crop. The most ambitious irrigation project is that of the Canadian Pacific Railway, which when complete will supply water to a block of land of 3,000,000 acres adjacent to the company's right-of-way.

While Alberta is obviously not distinctly a lumber country, still the forest resources are very considerable. The chief merchantable timber is spruce, of which heavy stands are found here and there, especially in the northerly part of the province. The forest reserves of Alberta cover 26,112 square miles. Of this vast area, nearly 13,000,000 acres lie along the eastern slope of the Rocky Mountains and extend in a northwesterly direction some 450 miles from the international boundary. Under the inspiration of the Forestry Branch and the Dominion Commission of Conservation, intelligent measures are being enacted for the conservation of provincial forests. In 1912 the lumber cut was approximately 50,000,000 feet. Of this 90 per cent was spruce. The remainder was made up of small quantities of pine, poplar, Douglas fir and tamarack.

Minerals.— Alberta is known to contain large deposits of minerals. Indications of petroleum have been found at many far-scattered points. Hitherto, however, only one region — that to the south of Calgary — has actually produced oil. Natural gas is found in large quantities in the Medicine Hat–Bow Island district and is piped into the city of Calgary. At Pelican rapids on the Athabasca River natural gas exists but owing to there being no settlements of any size it has not yet been utilized. A new gas field has recently been discovered at Viking on the Grand Trunk Pacific Railway east of Edmonton. Several wells have been successfully sunk and it is expected that Edmonton will shortly be supplied with natural gas from this field. At McMurray on the Athabasca River are immense deposits of tar sands. The commercial value of these, whether for the paving of roads or for highly valuable extractive matter which may be wrested from them by chemical processes, is a question undergoing investigation in the laboratory. Other minerals are known to exist but owing to lack of transportation or other difficulties have not yet been developed. It remains to speak of coal, the one mineral industry whose exploitation has already assumed substantial and permanent form. Very wide areas of the province are underlaid with coal. Anthracite is mined near Banff. Extensive deposits of bituminous coal, an excellent steam and coking coal, are found in the Crowsnest Pass as well as in the Palliser, Costigan and Bighorn fields. The commonest coal is lignite, and of this inexhaustible quantities occur. According to the report of D. B. Dowling submitted to the Geological Survey in 1909, coal underlies nearly 17,000 square miles of territory and the total quantity is estimated at upward of 90,000,000,000 tons. The production of coal is steadily increasing. Two hundred and eighty thousand tons were mined in 1901, while in 1914 the number of collieries operating was 264 and the production of coal had risen to 3,821,739 tons.

Transportation.— Three transcontinental railway lines traverse Alberta from east to west. The pioneer line, the Canadian Pacific, crosses the province in the southerly section. The main line running through Medicine Hat and Calgary ascends the valley of the Bow and threads the Kicking Horse Pass on its way to the Pacific coast. Leaving the main line at Medicine Hat, the Canadian Pacific Company also operates a line connecting Medicine Hat with Lethbridge, and crossing the mountains by way of the Crowsnest Pass, proceeds toward tidewater. Besides these through lines the company has constructed a complex system of branch lines. The chief of these are the line running north and south and connecting Edmonton with Calgary and that running east from Edmonton and giving the latter city direct touch with Winnipeg. The Canadian Pacific continues steadily its policy of expansion and during the decennial period, 1905–15, this company's mileage in Alberta increased from 1,060 to 1,909. In 1906 a rival railway, the Canadian Northern, appeared on the scene, laying down that year 178 miles of steel. In 1909 and the following years, encouraged by liberal finan-

cial support from the provincial legislature, the Canadian Northern carried out an ambitious program of construction. In 1915 the company's mileage in Alberta had risen to 1,247. In this same year the Canadian Northern Railway transcontinental line following the valley of the North Saskatchewan, and connecting Edmonton via the Yellowhead Pass with Vancouver, was also put into operation. In 1908 the Grand Trunk Pacific, in course of construction as a transcontinental, began to build in Alberta. With assistance from both the Dominion and provincial governments, this company's system steadily grew. In 1914 the main line connecting Winnipeg, Edmonton and Prince Rupert, was opened to traffic. At the close of 1915 the Grand Trunk Pacific Company was operating 707 miles of railway in the province. Apart, however, from the line running north from Edmonton some 90 miles to Athabasca, the northerly half of the province—a hinterland known to be rich in resources and into which settlers were pouring—was without railway communication. In 1912, as a result of contracts entered into between the provincial government and a group of capitalists, construction was commenced on the Edmonton, Dunvegan and British Columbia Railway running in a northwesterly direction from Edmonton to the Peace River Valley. This line is now in operation to Peace River, there coming in touch with the vast system of northern navigable waterways. Under the name of the Alberta and Great Waterways, this group is also engaged in the building of a line in a northeasterly direction from Edmonton to McMurray on the Athabasca River. At this point great mineral resources will be made available and connection given also via the Athabasca River with navigable streams and lakes leading to the Mackenzie and thence to the Polar seas. The total mileage of railways in the province of Alberta at the close of 1915 was 4,423 miles—showing an average annual increase for the decennial period of 332.3 miles.

Population.—The population of the province has in late years shown rapid growth. According to the Dominion census of 1901 it totalled 73,022. In 1911 official figures gave a return of 374,663. The population according to census of 1916 is 496,525. In recent years heavy immigration has taken place, especially from the British Isles and the United States. Settlers in considerable numbers have also come into the province from Germany, Austria-Hungary and the Scandinavian countries. The census of 1911 shows the chief religions to be represented as follows: 66,351 Presbyterians, 62,193 Roman Catholics, 61,844 Methodists, 55,628 Anglicans, 43,311 Lutherans, 19,491 Baptists, 18,149 Greek Church, 2,628 Congregationalists, 1,524 Mennonites, 1,207 Jews. Numerous minor varieties of religious faith are also represented.

Education.—Education is by law free and compulsory. Owing, however, to difficulties arising from rapid settlement and imperfect transportation, it has proved neither always wise nor always possible rigidly to enforce compulsory attendance at school. Any section of the province may be erected into a school district provided (1) it does not exceed four miles in length or breadth; (2) it contains four persons liable to assessment and eight children between the ages of 5 and 16. The number of schools down to the close of the year 1914 was 2,027 and the number of children enrolled 89,910. All schools are subjected to regular inspection by government officials and the annual examinations in the upper grades are conducted directly by the provincial department of education. The school system is supported by direct taxation and by grants in aid made by the provincial government. By the terms of the British North America Act, a certain percentage of the Crown lands was set apart for the endowment of public education. In Alberta, sections 11 and 29 in every township are designated for this purpose. The money accruing from the sale of these lands is held by the Dominion government in trust for Alberta and the income paid to the province for the support of the school system. For the training of teachers two normal schools have been established—one at Calgary and one at Camrose. Instruction in manual arts, domestic science and vocational training generally is provided for in the Institute of Technology and Manual Arts in Calgary. In 1908 the University of Alberta was founded. This is a state institution and occupies a site of 258 acres fronting the Saskatchewan in the city of Edmonton. It is well equipped with buildings and laboratories. There are in operation faculties of arts and sciences, applied science, medicine, law and agriculture, and schools of pharmacy, accountancy and dentistry. The enrolment of students in 1915–16 was 418. Nowhere perhaps in America has professional education been brought so completely under direct and central public control as in Alberta. This has been accomplished by making the University of Alberta on behalf of the province responsible for the conduct of the licensing examinations of practically all the professional societies.

History and Government.—The history of Alberta may be summarized in a word or two. It has consisted largely in the efforts of the government to keep pace in the provision of educational and transportation facilities with the tide of settlement pouring into a new country. Schools, roads, bridges, necessary public buildings, the encouragement of methods of farming suited to the province, the organization of the country generally—in the record of these efforts consists the history of Alberta since the province came into being. The governmental system of Alberta resembles that of most of the Canadian provinces. Representing the Crown there is a lieutenant-governor appointed from Ottawa, a single popular chamber, known as the legislative assembly, of 55 members elected on a suffrage equally shared by men and women. Executive power lies in the hands of a cabinet of seven members, who must hold seats in the legislature and are responsible to it. The Liberal party has been in power since the Autonomy Act of 1905. The first premier was the Hon. A. C. Rutherford, who as the result of a political crisis was succeeded in 1910 by the Hon. A. L. Sifton.

Chief Cities and Towns.—Edmonton, the provincial capital and seat of the provincial university, is picturesquely situated on both banks of the North Saskatchewan. The city has handsome public buildings, is a very important railway centre and has a population of 53,846. Calgary is a substantial and prosperous

manufacturing and commercial city located at the confluence of the Bow and Elbow rivers and commanding a beautiful view of the Rocky Mountains. The population is 56,514. Lethbridge, population 9,436, and Medicine Hat, population 9,272, are busy industrial communities. Other important towns are Red Deer, Wetaskiwin, Lacombe, Macleod, Camrose, Stettler, Olds, Cardston, Vegreville, Vermilion and Peace River.

WILLIAM A. R. KERR,
Dean of the Faculty of Arts and Sciences, The University of Alberta.

ALBERTI, äl-bĕr'tē, **Leone Battista degli,** Italian architect, painter, poet, musician and philosopher: b. Venice, 18 Feb. 1404; d. Rome, April 1472. Excelling in physical and social accomplishments, a man of most attractive personality, master of almost all the arts, he ranked equally high as dramatist, poet, philosopher, and was one of the best of contemporary organists. While his essays on painting and sculpture are greatly admired, his most important work is 'De Re Aedificatona' (1485), which was freely translated into other languages. He was architect to Pope Nicholas V, and designed many fine edifices in different cities, notably the Church of Sant' Andrea at Mantua, and the fine church of San Francesco at Rimini. Consult Manzini, M., 'Vita di Alberti' (Florence 1882).

ALBERTINELLI, äl-bĕr'tē-nĕl'lē, **Mariotto,** Italian artist: b. Florence, 1474; d. there 1515. He was fellow-pupil, friend and partner of Fra Bartolommeo until the latter's retirement into a monastery. His pictures, ranking among the finest of the Renaissance period, include 'The Visitation of the Virgin (1503), his masterpiece in the Uffizzi Palace; a 'Holy Family,' in the Pitti Gallery, and an 'Annunciation' (1510), in the Florence Academy.

ALBERTITE, or **ALBERT COAL,** a pitchlike mineral of brilliant jet black color first discovered by Henry W. Eskildon and other mining engineers in Albert County, New Brunswick. Like the district, it was named after Albert, Prince Consort to Queen Victoria. Albertite is found in the lower carboniferous group, consisting of red sandstones, green marls and beds of fossiliferous limestones accompanied by gypsum. It is not a true coal and is very much lighter in weight per bulk, compared with ordinary coal. It ignites freely from a match and burns like a candle, leaving a fine, almost impalpable ash. It analyzes as free carbon, 82.67; hydrogen, 9.14; oxygen and nitrogen, 8.19. Albertite has sold at $45 per ton, and is used for enriching gas, in the preparation of fine varnishes, etc.

ALBERTUS MAGNUS, COUNT OF BOLLSTÄDT, German scholastic philosopher: b. Laningen, Suabia, 1206; d. Paris, 25 Nov. 1280. He was educated principally at Padua, where he was instructed in the writings of Aristotle. In 1223 he joined the Dominican order and studied theology in the houses of the order at Bologna and elsewhere. He was appointed lecturer at Cologne, and later taught at Regensburg, Freiburg, Hilderheim and Strassburg. Thomas Aquinas was his pupil at Cologne. He went to Paris in 1245, received the degree of doctor and taught there with great success. He was appointed German Provincial of the Dominicans in 1254 and fulfilled the duties of the office with great care and efficiency, instituting many reforms in the monasteries and defending the mendicant orders against the attacks of the University of Paris. At this period he also answered the errors of Averröes, the Arabian philosopher. In 1260 he was appointed bishop of Regensburg by Pope Alexander IV, but resigned this office in 1263. He spent the remainder of his life in preaching throughout Bavaria and adjoining districts; in 1270 he preached the 8th Crusade in Austria. He attended the council of Lyons in 1274, and soon after at Paris publicly defended the orthodoxy of his former pupil, Thomas Aquinas. His great literary activity is attested by his works (published in 21 folio volumes by Pierre Jammy, Lyons 1651, and reproduced by the Abbé Borgnet, 36 vols., Paris 1890). He was the most widely read and most learned man of his time. He was the greatest student of Aristotle up to his time. His chemical and mechanical knowledge was remarkable in his age and brought upon him the imputation of sorcery. His best known works are 'Summa de Creaturis' and 'Summa Theologiæ.' Consult Sighart, J., 'Albertus Magnus, sein Leben und seine Wissenschaft' (Regensburg 1857; English trans. by Dixon, London 1876), and Erdman, J. E., 'History of Philosophy' (Vol. I, London 1890).

ALBI, äl'bē, France, city, capital of the department of Tarn, 48 miles by rail northeast of Toulouse, built on a height rising nearly 600 feet above the river Tarn. The fortress cathedral church of Saint Cecilia, dating from 1277 to 1512 and the 14th century fortress palace of the archbishop, are the most notable buildings. Albi as the home of the Albigensian Cathari of the 13th century suffered severely during the religious wars. A large agricultural trade is carried on and there are extensive manufactures of brick. Pop. 25,000.

ALBIA, Iowa, city and county-seat of Monroe County, 65 miles southeast of Des Moines, on the Chicago, Burlington and Quincy, the Wabash, the Minneapolis and Saint Louis, and other railroads. Considerable quantities of coal are mined in Monroe County and the city has a large trade in this commodity and also in the grain, livestock and other agricultural products of the district. Its industrial establishments consist of a telephone factory, metal works and a packing plant. Pop. 5,342.

ALBICORE, or **ALBACORE.** See TUNNY.

ALBIGENSES, äl'bē-gĕn-sēz, a religious sect, coming first into prominence in the 12th century, and taking its name from Albi, their principal stronghold. What their doctrines were has not been determined, as no formal statement of them was ever drawn up. It appears that the Albigenses held beliefs similar to those of the Patarins in Italy, the Bulgarians in France and other similar sects. They styled themselves Cathari the Pure and traced their doctrines to the Manichean sect known as Paulicians, that settled in Bulgaria, whence their tenets spread to France.

They taught the doctrine of the Manicheans, that there are two opposing creative principles,

one good, the other evil; the invisible word proceeding from the former, the body and all material things from the latter. "Their teachers assumed a great simplicity of manners, dress and mode of life. They inveighed against the vices and worldliness of the clergy, and there was sufficient truth in their censures to dispose their hearers to believe what they advanced and reject what they decried. They also rejected the Old Testament, said that infant baptism was useless, and denied marriage to the 'perfect' as they called their more austere members." (Addis and Arnold's 'Catholic Dictionary').

On the other hand the license permitted to the imperfect gave rise to so much fanaticism and grave social and moral disorders as to threaten the destruction of Christian civilization in the heart of France. They had increased very much toward the close of the 12th century in the south of France, about Toulouse and Albi, and in Raymond, Count of Toulouse, they found a patron and protector. Innocent III, after trying in vain to reform the abuses prevalent among them, was so incensed by the assassination of the papal legate, Peter of Castelnau, in 1208, that he proclaimed a crusade against them, and was supported by the King of France.

An army was accordingly collected, large numbers of those composing it being mere mercenaries and adventurers brought together by the hope of plunder rather than by zeal for the Catholic faith. The chief leader was Simon de Montfort, father of the well-known Earl of Leicester. Raymond's territories were ravaged, and in 1209 the crusaders took Beziers by storm and put a number of the inhabitants to the sword. Simon de Montfort was equally severe toward other places in the territory of Raymond and his allies, of whom Roger, nephew of Raymond, died in a prison and Peter I, King of Aragon, in battle. The lands taken were presented as a reward for his services to Simon de Montfort, who, however, was killed at the siege of Toulouse in 1218. When Innocent III heard of the cruelties of the invading armies he recalled his legate Milo for his weakness in not restraining Simon and restored to Raymond the captured territory. Soon after, however, Raymond once more espoused the cause of the Albigenses. He died in 1222, under excommunication, and his son, Raymond VII, was obliged to defend his inheritance against the legates and Louis VIII of France, who fell in 1226 in a campaign against the Albigenses. After thousands had fallen on both sides a peace was made in 1229 by the terms of which Raymond was released from the penalties in consideration of a large tribute. He ceded Narbonne, with several estates, to Louis IX, and made his son-in-law, a brother of Louis, heir of his other lands.

ALBINISM, a condition in which there is a congenital absence of pigment in the hair, eye and skin. Animals so affected are albinos. Albinism is also present in the flowers of many if not all plants, white flowers occurring among those of other color on the same plant. Albinos have been known among all races and all peoples, hence neither climate nor race are its causative factors. Rare in many races, it occurs frequently in others, as for instance in the Zuni and other tribes of Arizona. The most widely accepted theory is that the condition is due to an arrest of development of the pigment layers in the embryo. Affections of the eye are the most important disagreeable features for albinos.

ALBINUS (Weiss), Bernhardt Siegfried, German physician, one of the greatest anatomists of his time: b. Frankfort-on-the-Oder, 24 Feb. 1697; d. Leyden, 7 Sept. 1770. Besides editing the works of Harvey he published 'De Ossibus Corporis Humani' (1726); 'Historia Musculorum Hominis' (1734); and 'Tabulæ Sceleti et Musculorum Corporis Humani' (Leyden 1747), illustrated with costly plates prepared under his own supervision. From 1718 he was professor of anatomy, and from 1745 professor of medicine at the University of Leyden.

ALBION, the earliest name by which the island of Great Britain was known, employed by Aristotle, and in poetry still used for Great Britain. The Greeks and Romans probably received the name from the Gauls, in whose language it would mean mountain-land or white-land, from the Celtic *alp, alb,* said to mean high or white (whence also Alps), the latter name being given to it in reference to the chalky cliffs on the coasts.

ALBION, Mich., city in Calhoun County, situated on Kalamazoo River, the Lake Shore and Michigan Southern and the Michigan Central railways, 28 miles south of Lansing. There are manufactures of farm tools, malleable iron, automobile cushion springs, automobile hubs, wire screens. Over 2,000 men are employed in the iron-working industries. It has two banks, with a combined capital of $100,000; six churches and good schools. Albion College (q.v.) is located here. Albion is governed by commission-manager form of government. Four commissioners, elected one a year for four-year terms, hire a city manager. First settled in 1831, became a borough in 1855, incorporated in 1885. Pop. (1916) 8,000.

ALBION, N. Y., the county-seat of Orleans County, on the New York Central and Buffalo, Lockport and Rochester railroads, and the Erie Canal, about 51 miles northeast of Buffalo and 31 miles west of Rochester. It has two national banks with a combined capital of $1,731,619, one high school and four public schools, public parks, a free library, several churches and five newspapers. The House of Refuge for Women is located here, and among other places of interest are the court house, surrogate and county clerk building, Pullman Memorial Church and Mount Albion Cemetery. It is a prosperous fruit and agricultural community and has important agricultural industries, three canning factories and large stone quarries. Cement, building blocks, etc., are also manufactured. The value of taxable property is $4,030,050. The city is lighted by electricity. The affairs of the community are administered by a mayor, elected triennially, and board of trustees. Albion was first settled in 1812, incorporated 1828. Pop. 6,000.

ALBION, New. See NEW ALBION.

ALBION COLLEGE, a coeducational institution in Albion, Mich., established as a seminary under the auspices of the Methodist Epis-

copal Church in 1835, organized as a college in 1861. Professors and instructors in 1914, 26; students, 516; volumes in the library, 21,000; grounds and buildings valued at $250,000; endowment fund, $355,000; productive funds, $405,000; income, $61,644. It has beside the college department a business department, preparatory department and schools of music and painting.

ALBITE, an important member of the feldspar group of minerals. It stands at one end of the albite-anorthite series of triclinic feldspars (see FELDSPAR GROUP). It is a sodium-aluminum silicate, $Na\ Al\ Si_3O_8$, and is often called "soda feldspar." It has perfect basal cleavage and also cleaves easily parallel to the brachypinacoid. It is brittle, breaking with an uneven to conchoidal fracture. Its hardness is 6 to 6.5, and specific gravity about 2.63. Its usual color is white, whence its name (from "albus," white), but it is occasionally gray or tinted with blue, green or red. The variety peristerite shows a delicate blue iridescence, similar to the "change of colors" of moonstone, which is also sometimes a variety of albite. Cleavelandite is a common lamellar variety, named in honor of the eminent mineralogist, Dr. P. Cleaveland, who died in 1858. Albite crystals present a great variety of forms, some of the simpler of which are quite similar to those of the monoclinic orthoclase, with which albite is often associated in parallel growths and intergrowths such as perthite. Twinning is even more common in albite than in orthoclase, and their analogy is shown by the occurrence of Carlsbad, Baveno and Manebach twins. Several other laws of twinning are, however, followed by albite, notably those known as the "albite law" and the "pericline law." Both of these types are very common and often manifest themselves by the polysynthetic twinning lamellæ which are so characteristic of the plagioclase feldspars. Albite often occurs in tabular crystals and embedded masses in which this twinning is revealed by striations on the basal plane. Probably the most striking occurrence of albite is at Amelia, Va., this locality producing large groups of tabular crystals, each over a foot in length. It usually occurs in granite or gneiss, and less frequently in the crystalline schists. It is found but rarely in volcanic rocks and in limestones. Many of the most highly prized gem minerals, such as topaz, beryl and tourmaline occur in albitic granite, while albite is often a guide mineral to columbite, allanite and other rarer minerals. It is also an essential constituent of dioryte. There are many noteworthy localities in Switzerland, the Tyrol, Cornwall and elsewhere in Europe, while it abounds throughout the Atlantic Coast States, and is found in especially attractive specimens on amazonstone in Colorado.

ALBO, Joseph, a Spanish-Hebrew theologian and preacher: b. about 1380; d. 1444. His celebrated work 'Ikkarim' ('Principles'), published 1485, is described by Tanzer as "a well-conceived contribution to the apologetics of Judaism"; it reduces the basic principles of Judaism to three: The existence of God, revelation, divine retribution, and is a standard popular treatise which has been of great importance in shaping Jewish thought and confirming Jewish religious faith. An English translation appears in the *Hebrew Review,* Vols. I–III. Consult Back, S., 'Joseph Albo' (Breslau 1869); Tänzer, 'Die Religions-philosophie des Joseph Albo' (Pressburg 1896).

ALBOIN, äl'boin, King of the Lombards, conqueror of Italy: d. about 573; succeeded his father in Pannonia in 565; allied himself with Narses against the Ostrogoths; with the Avers against the Gepidæ, whose King, Cunimond, he defeated and slew, 567; invaded Italy, which he overran as far as the Tiber, and after a three-years' siege took Parra which he made the Lombard capital in 572. He had married as his second wife his prisoner, Princess Rosamond, daughter of Cunimond. At a feast in Verona he compelled her to drink out of her father's skull which he had transformed into a goblet trophy. In revenge she persuaded her paramour, Helmichis, to assassinate Alboin. Rosamond fled with Helmichis to Ravenna where, flattered by the attentions of the exarch Longinus, she administered poison to Helmichis. He, discovering her treachery, compelled her to drink a similar fatal draught, and they died together. Alboin is one of the prominent figures in early German literature.

ALBONI, al-bō'nē, **Marietta,** Italian contralto: b. 1823; d. 1894. At the age of 15 she made her début at Bologna as Orsini in 'Lucrezia Borgia,' and thereafter until her final appearances in opera in Paris and in Munich in 1872, was an artist of international reputation, ranking next to Malibran as the finest contralto of the period. Her range, of the most beautiful, true, equal and sonorous quality, extended over a compass of two and a half octaves from F in the bass to C in alt of the soprano. Her favorite parts were in the operas of her teacher and coach, Rossini, 'Gazza Ladra,' 'La Donna del Lago,' 'Semiramide' and 'Cenerentola.' She appeared in the United States on a professional tour in 1852, and for over a year sang in opera, oratorio and concert in the principal cities. She married Count Pepoli, who died in 1866. In 1877 she married M. Zieger, a French officer.

ALBOV, Mikhail Nilov, Russian man of letters: b. Saint Petersburg 1851. From his earliest childhood he showed a manifest love for reading, especially of foreign masterpieces. 'Robinson Crusoe,' 'David Copperfield' and 'The Dead Souls' left on him the deepest impression. While still in the second grade in gymnasium he wrote two minor humoristic stories which were soon followed by a number of novelettes with Spanish and Italian heroes. Imitating Dumas' 'Comte de Monté-Christo,' he wrote a novel entitled 'The English Sailor' and at the age of 13 wrote a story in the form of a diary, 'The Memoirs of an Underground Lodger,' which the *Peterburski Listok* accepted and published. Intoxicated by that success Albov abandoned school altogether and dedicated all his efforts to the literary field. It was then that his first novel, of considerable importance, 'On the New Road' (1866), appeared and attracted general attention. A few years later (1873) he re-entered the gymnasium, finished his course, matriculated at the university and was graduated from the Faculty of Law in 1879. He took a post in the civil service only to resign a few months later. Besides the above works he wrote in rapid succession 'The

Wretches of Petrograd,' 'The Dog that Ran Away,' 'In the Rear of an Army,' 'The End of an Unknown Street,' 'A Chapter from an Unfinished Novel,' 'Transport,' 'A Terrible Word,' 'The Garden of Babel' and many others. His earlier novels show the powerful influence which Dostoyevski exercised over the young author and are distinguished by a sombre character, a youthful subjectivism and a singular autoanalysis. But in his later works (especially in 'The End of an Unknown Street'), the dark colors disappear and a warm sincerity and a bright poetry are apparent throughout. However, he has not succeeded in developing into a true artist owing to his strong inclination toward a self-created psychiatry and rough naturalism. Consult Skabich, 'Istoriya Nov. Lit.'; Arsenyed, K. K., 'Krit. Eyudy no Russk. Liter.'

ALBRECHTSBERGER, äl'brĕkts-bĕrk'er, **Johann Georg,** Austrian organist, composer and theorist: b. 1736; d. 1809. Of the leading masters of counterpoint, among his famous pupils were Moscheles, Weigl, Seyfried, Hummel and notably Beethoven, whose vagaries, however, misled his teacher to declare 'that young man would never turn out anything in good style.' Albrechtsberger was appointed organist to the court of Vienna in 1772 and kapellmeister of Saint Stephen's Cathedral in 1792. His fame rests less on his numerous compositions than on his valuable theoretical works: 'Kurzgefasste Methode, den Generalbass zu erlernen' (1792); 'Gründliche Anweisung zur Composition' (1818), republished in 'Generalbasschule,' edited by I. von Seyfried (3 vols., Vienna 1826); English translation by V. Novello (London 1855).

ALBRET, äl'brā', **Jeanne d',** Queen of Navarre, daughter of Henry II of Navarre and Margaret of Valois (sister of Francis I of France), was the mother of Henry IV of France and a zealous supporter of the reformed religion, which she established in her kingdom. She was b. in 1528; d. 1572. She married Antoine de Bourbon in 1548, succeeded her father on the throne of Navarre and Béarn in 1555, reigned in conjunction with her husband till his death in 1562, and afterward alone.

ALBUFERA, äl'boo-fā'ra, a lake about nine miles square near Valencia, Spain, supposed to have been excavated by the Moors. It is separated from the sea by a strip of land. The revenues from the fisheries of the lake belonged at one time to the Duke of Wellington.

ALBULA, äl'bu-la, Swiss river in the Canton Grisons, an affluent of the Rhine, 29 miles in length, in which distance it falls over 4,500 feet.

ALBULA PASS, at the head of the Albula Valley, about 7,600 feet above the sea. In this pass is the most direct road from the valley of the Inn to the valley of the Hinter-Rhein. A railroad now runs through it.

ALBUM, among the Romans, a board or tablet on which official notices, such as the prætor's edicts, lists of the members of public bodies, etc., were written, and which was put up in some public place to be seen by all. It was so called either because it was of a white material (*albus,* white) or a material whitened, or because the writing on it was in white. Album is a name now generally given to a blank book for the reception of pieces of poetry, autographs, engravings, photographs, etc.

ALBUMAZAR, äl'boo-mä-zĕr, or **ABOU-MASCHAR, Djafar Ibn-Mohammed,** Arab astronomer: b. Balkh 805; d. Wasid 885. He lived in Bagdad and wrote over 50 books, some of which have been translated in Latin. In 'De Magnis Conjunctionibus' (Augsburg 1489) the theory is advanced that the world was created when the seven planets were in conjunction in the first degree of Aries, and the prediction is made that it will come to an end when the same conjunction occurs in the last degree of Pisces. His other notable works are: 'Flores Astrologici' (Augsburg 1488), and 'Introductorium in Astronomiam' (Venice 1506).

ALBUMEN, or **ALBUMIN** (Latin from *albus,* white), a substance, or rather group of substances, so named from the Latin for the white of an egg, which is one of its most abundant known forms. The albumins enter largely into the composition of the animal fluids and solids, are coagulable by heat at and above 160° and are soluble in water and dilute salt solutions. The albumins are present in the serum of the blood, the vitreous and crystalline humors of the eye, the fluid of dropsy, the substance called coagulable lymph, in nutritive matters, the juice of flesh, etc. The blood contains about 7 per cent of albumen. The albumins belong to the class of simple proteins, which are nitrogenous organic substances, widely distributed in nature. They consist largely of amino acids united by their carboxyl or amino groups. These simple proteins are divided into about seven groups, albumins, globulins, glutelins, prolamines, albuminoids, lustones and protamines. (See PROTEINS). Consult Matthews, 'Physiological Chemistry.'

ALBUMINOID. See PROTEIDS.

ALBUMINURIA, a condition characterized by the presence of albumen in the urine, indicating some disturbance of the kidney function, mild or severe. Thus there may be a functional or physiological albuminuria, following excessive exercise, such as bicycling; febrile albuminuria as a result of fever, being especially common in malaria, pneumonia, diphtheria and typhoid; hæmic albuminuria accompanying blood diseases, lukæmia, anæmia; toxic albuminuria from poisoning by lead and mercury, syphilis, etc. The presence of an albuminuria always calls for a determination of its causation. See KIDNEYS.

ALBUNOL, äl'boon-yōl, Spain, town in the province of Granada, near the Mediterranean, on which it has a harbor, some 35 miles to the south of the city of Granada. Pop. 18,000.

ALBUQUERQUE, Affonso d', al'bö-kārk'e, "the Great," viceroy of the Indies: b. near Lisbon 1453; d. Goa, 16 Dec. 1515. The Portuguese had discovered and subjugated a great part of the western coast of Africa and were beginning to extend their dominion over the seas and the people of India. Albuquerque, being appointed viceroy of these new possessions, with a fleet and some troops landed on the Malabar coast in 1503; conquered Goa, which he made the seat of the Portuguese gov-

ernment and the centre of its Asiatic commerce; and afterward Ceylon, the Sunda Isles, the Peninsula of Malacca, and the island of Ormuz at the entrance of the Persian Gulf. When the King of Persia sent for the tribute which the princes of this island had formerly rendered to him, Albuquerque presented bullets and swords to the ambassador, saying: "This is the coin in which Portugal pays her tribute." He made the Portuguese name profoundly respected among the princes and people of the East; and many of them, especially the Kings of Siam and Pegu, sought his alliance and protection. He maintained strict military discipline, was active, far-seeing, wise, humane and equitable, respected and feared by his neighbors while beloved by his subjects. His virtues made such an impression on the Indian peoples that long after his death they resorted to his grave to implore his protection against the misgovernment of his successors. Yet he did not escape the envy of courtiers and the suspicions of his King, who appointed Soarez, a personal enemy of Albuquerque, to supersede him as viceroy. This news reached him just as he was leaving Ormuz, and gave a severe shock to his shattered health and he died a few days later.

ALBUQUERQUE, al'bū-kŭr'ke, N. M., largest city of the State and county-seat of Bernalillo County; situated on the Rio Grande and the Atchinson, Texas and Santa Fé and the Santa Fé and New Mexico Central railroads, 56 miles in a direct line southwest of Santa Fé. It has an elevation of 4,930 feet above sea-level; is an ancient and interesting settlement, divided into the Old and New towns and is the seat of the University of New Mexico and of a government school for Indians, the latter founded in 1881, the former organized in 1889. Under the Spanish régime, Francisco Cuervo y Valdez became governor of New Mexico 10 March 1705, and he established in 1706 a town or "villa" to which he gave the name Alburquerque (now Albuquerque) in honor of the viceroy of New Spain, the Duke of Alburquerque (not to be confused with the Portuguese Alfonso d'Albuquerque). The church of S. Felipe, which was built almost immediately afterward, has never been entirely destroyed, and therefore the present edifice in the "Old Town" may still claim to be its continuation (consult Prince, 'Spanish Mission Churches of New Mexico,' Cedar Rapids 1915). The city is renowned as a health resort, the winter climate being exceptionally good, and six large sanatoriums have been located here. Noteworthy features are the Federal building and the Harvey Indian Museum with its large and truly representative collection of Indian baskets and blankets. The Isleta Indian pueblo is about 13 miles distant, toward the south. The last census showed that 16.3 per cent of the total value of New Mexico's products must be credited to Albuquerque. The varied industries range from mining (gold, copper, lead, zinc) to fruit-growing and truck-farming. We mention also the extensive lumber interests, railroad shops, woolen mill, Indian trading company, foundries and machine shops, flour mills and tie-preserving plant. The United States census of 1914 reported 55 manufacturing establishments of factory grade employing 1,008 persons, of whom 847 were wage earners, receiving a total of $654,000 in wages. The capital employed aggregated $1,593,000, and the output was valued at $1,914,000; of this, $1,020,000 was added by manufacture. These figures show an increase of 48.6 per cent over those of 1909. Pop. (1910) 11,020; (1916) 20,000.

ALBURNUM, the soft white substance which, in trees, is found between the liber or inner bark and the wood and, in progress of time acquiring solidity, becomes itself the wood. A new layer of wood, or rather of alburnum, is added annually to the tree in every part just under the bark.

ALBURY, Australia, town of Goulburn County, New South Wales, at the head of navigation of the Murray River, 1,800 miles from its mouth, and by rail 386 miles from Sydney and 200 miles from Melbourne. Albury was reached by explorers in 1824 and was created a municipality in 1859. It is a sheep-raising and farming centre, noted for its manufactures of wine, which with wool, cereals, tobacco and grapes are its staples of commerce. Pop. 6,300.

ALCÆUS, äl'kai-ŭs', Greek warrior-poet and lyricist: b. Mitylene, Lesbos, in the 7th century B.C. From 606 B.C. he was active in the war between the Athenians and Mitylenians, and in the factions of his native city, which led to his exile for a considerable period. Contemporary with Sappho he was the author of numerous martial and patriotic hymns, love lyrics, bacchanalian songs, epigrams and other poems, originally collected in 10 books. They are said to have exhibited the Æolian lyric in highest perfection, but fragments only exist; one of the latest discovered with some fragments of Sappho is mentioned in the 'Classical Review' (May 1902). The Alcaic metres, admired and imitated by Horace, and in modern days by Tennyson and others, are claimed to have originated with him. Consult Bergk, T., 'Poetæ Lyrici Græci' (Leipzig 1882); Farnell, L. R., 'Greek Lyric Poets' (London 1891); Smyth, T., 'Greek Melic Poets' (New York 1900); Easby-Smith, J., 'The Songs of Alcæus' (Washington 1901).

ALCALA, äl'ka-lä', name of seven cities in Spain, but by far the most important in Spanish history is Alcala de Henares, province of Toledo. Cardinal Ximenes began the first building of the University of Alcala in 1500. Francis I, in 1517, declared that the cardinal had done for Spain what it had taken many kings to do for France. It was in Alcala that the famous Complutensian Polyglot Bible was brought forth.

ALCAMENES, äl'kä-mĕ'nēz, Greek sculptor of the 5th century B.C., pupil and co-worker with Phidias at Athens on the Parthenon. His masterpiece, now lost, was the 'Aphrodite in the Garden,' at Athens, presumably reproduced in the well-known statues of "Venus Genetrix."

ALCAMO, äl'ka-mō, Italy, a town of Sicily, province of Trapani, 25 miles direct southwest and 52 miles by rail, from Palermo. A Saracenic town dating from the existing castle built 828; it has several interesting mediæval buildings, and in the neighborhood are the ruins of ancient Segesta. Mount Bonifato on the south, 2,700 feet high, affords splendid views of Castellamare Bay. Quarries of yellow marble

are worked in the neighborhood and a considerable agricultural trade is carried on. Pop. 35,000.

ALCANTARA, ạl-kän'tạ-rä, Spain, fortified town of Estremadura, on the left bank of the Tagus, near the Portuguese frontier, noted for the Roman bridge built by Trajan in 105 A.D. Of uncemented stone, 616 feet long and 190 feet high, with six arches, it was partly blown up by the British in 1809 during the Peninsular war, and also suffered in the Civil war of 1836. A ferry was used until the bridge was restored in 1860. Here in 1215, when Alcantara had been recovered from the Moors, was organized for defense the celebrated order of monk-soldiers, the Knights of Alcantara. Pop. 3,700.

ALCANTARA, Brazil, seaport town at the entrance to S. Marcos Bay, 17 miles northwest of Maranhao. A coasting trade is carried on in salt, cotton, rice, coffee, hides and sugar. Pop. 10,000.

ALCAZAR DE SAN JUAN, ạl-kä'thär dạ sän hwän', Spain, town and important junction of the Madrid–Albacete and Madrid–Manzanares railroads, province of Ciudad Real, 48 miles northeast of Ciudad Real. In the neighborhood are large iron mines, deposits of salt and alkali, and an important trade is carried on in local manufacture of soap, daggers, gunpowder, chocolate and wines. The Roman Alce dating from the 2d century around Alcazar is much of the country described by Cervantes in his immortal 'Adventures of Don Quixote.' Pop. 14,000.

ALCESTIS (438 B.C.), the earliest extant play of Euripides, is one of the most touching dramas that have come down to us from antiquity; some of the scenes, in the opinion of Racine, are incomparable. Alcestis, the daughter of King Pelias of Iolcus, married the Thessalian, Admetus, King of Pheræ, for whom she offered herself as a willing substitute when Thanatos (death) came to claim her husband. Admetus tried all his friends in turn, but

> • • • "found no one, who loved as much,
> No: father, nor the aged mother's self
> That bore him; no, not any, save his wife,
> Willing to die instead of him."
> — Browning, 'Balaustions' Adventure'

When Alcestis dies, Admetus gives himself up wholly to his sorrow and remains inconsolable, until Heracles brings her back from the tomb and restores her to her husband. The theme has also been treated in modern literatures. (Wieland, 'Glück's Opera,' Handel's 'Admeto'). [Consult Ellinger, 'Alceste in der modernen Litteratur' Halle 1885]. The supernatural side of the story is barely touched upon by Euripides. The beauty of the play consists in the portrayal of the emotions; the tenderness and piety of Alcestis, her firmness of soul, the sorrow of her husband, a sincere and affectionate though mediocre man, the naïve egoism of his father, Pheres, the touching farewells of the servants — all are portrayed with truth and skill. Alcestis has hardly a peer for virtue and true beauty of soul; in the poet's galaxy of noble women — Nacaria, Evadne, Iphigenia, Praxithea — she stands pre-eminent. The chorus possesses greater unity and strength than in any other Euripidean drama, with the possible exception of the 'Bacchae'; it forms an integral part of the play. The comic element in the 'Alcestis' is more pronounced than in any other Greek tragedy, primarily, perhaps, because the play was intended as an after-piece to a trilogy. In the saddest part of the drama the spectators behold the garrulous Heracles, sage as a philosopher, giving advice of doubtful morality to a servant in such a comical manner that even those who have been most affected by the touching scenes which they have just witnessed cannot refrain from smiling. This feature is an innovation of Euripides, who frequently makes use of comic elements in the most tragic situations.

JOSEPH E. HARRY.

ALCHEMIST, The. In 'The Alchemist,' the crowning composition of that second period of Jonson's comedy which began about 1605, we have, in Coleridge's judgment, one of the three perfect plots of all literature, revolving around characters whose very extravagances broaden our knowledge of human nature. The first of modern critics, Jonson subjected everything, his own work and that of his fellows, as well as the life of his times to the censure of a "pitiless method." This critical faculty in Jonson explains both the rigors of his technical codes and the note of conscious didacticism with which his work is sharpened. As an artist Jonson reprehended those who come in "robustiously," those who "seek to do more than enough," who "utter all they can, however unfitly." In observing his ideal of "election and mean" he clings to the unities of time, place and action.

Jonson's moral passions are the outgrowths of his rugged honesty of temper. His gallery of humors varies as it goes back to one of two sides of dishonesty and pretense, the commanding side which preys upon the weaknesses of its fellows; the weaker side of gulls and sycophants. Of the two it is not difficult to see for which Jonson has the greater sympathy. The dignity of Subtle's pretensions demands and secures a dignified going-out; and Face comes off scot-free because he has wit. Only the gulls are punished without pity. The personages of such a play as 'The Alchemist' have a double value. Subtle and Dol Common, Abel Drugger, Kastrill, Ananias and Tribulation Wholesome, are figures of London streets; but they are mental abstractions as well. In combining the pressure of personality with abstract qualities no writer is Jonson's equal.

Subtle, the Alchemist, belongs to an ancient order of cheaters that had been attacked by Chaucer as well as by Lyly. Alchemy as a science was no more believed in by London than were ghosts. To Jonson it meant the pretensions of learning, cozening the avaricious and fools. Subtle is the magnificent cheater. Face belongs to a very old family of sycophants in the history of comedy. Sir Epicure Mammon is a burlesque Jew of Malta brought under the sway of the cheater and revelling in the poetry of avarice. Dapper and Abel Drugger, Kastrill and the men of the church, are figures from contemporary life. The two in the play who are neither cheaters nor cheated are appropriately enough Surly and Lovewit. Like Shakespeare's women Jonson's women were written for men actors. He had none of

Shakespeare's witching power for putting womanhood over through the disguise. Dol Common, perhaps on account of her jovial masculinity, is a real character.

In its main features 'The Alchemist' is indebted to 'The Mostellaria,' or 'The Haunted House' of Plautus. First acted in 1610 the play was printed in 1612, and four years later, in the folio edition of his works, Jonson protects himself against the charge of imitating 'Albumazor,' a charge which in fact Dryden brought against the play 60 years later. The part of Dol Common was played by Cooke; and Robert Armin, the famous actor of clowns, played Abel Drugger. The play has had a long and honorable stage history. Revived after the Restoration Pepys rated it far beyond Shakespeare. In the 18th century Garrick played both Drugger and Face. The play was acted as farce at Drury Lane as lately as 1787. On account of the tender sensibilities of later times it is not now accounted suitable for the stage. Editions: Gifford, W. (9 vols., 1816); Cunningham, F. (9 vols., 1871–75); Mermaid Series, ed. Nicholson, B. (3 vols., 1893–94); 'Everyman's Library,' (Vols. 489, 490); Rys, E., 'Masterpieces of English drama' (1912). Consult Ward, A. W., 'A History of English Dramatic Literature' (1899); Swinburne, A. C., 'A Study of Ben Jonson' (1889); Symonds, J. A., 'Ben Jonson' (1886).

THOMAS H. DICKINSON,
Author 'The Contemporary Drama of England.'

ALCHEMY, or **ALCHYMY**, the art which in former times occupied the place of and paved the way for the modern science of chemistry (as astrology did for astronomy), but whose aims were not scientific, being confined solely to the discovery of the means of indefinitely prolonging human life, and of transmuting the baser metals into gold and silver. Probably the ancient nations, in their first attempts to melt metals, observing that the composition of different metals produced masses of a color unlike either — for instance, that a mixture like gold resulted from the melting together of copper and zinc — arrived at the conclusion that one metal could be changed into another. At an early period the desire of gold and silver grew strong as luxury increased, and men indulged the hope of obtaining these rarer metals from the more common. At the same time the love of life led to the idea of finding a remedy against all diseases, a means of lessening the infirmities of age, of renewing youth and repelling death. The hope of realizing these ideas prompted the efforts of several men, who taught their doctrines through mystical images and symbols. To transmute metals they thought it necessary to find a substitute which, containing the original principle of all matter, should possess the power of dissolving all into its elements. This general solvent or *menstruum universale*, which at the same time was to possess the power of removing all the seeds of disease out of the human body and renewing life, was called the philosopher's stone, *lapis philosophorum*, and its pretended possessors adepts. The more obscure the ideas which the alchemists themselves had of the appearances occurring in their experiments, the more they endeavored to express themselves in symbolical language. Afterward they retained this phraseology to conceal their secrets from the uninitiated. In Egypt Hermes Trismegistus was said to have left behind him many books of chemical, magical and alchemical learning. These, however, are of a later date. (See HERMES TRISMEGISTUS). After him chemistry and alchemy received the name of the hermetic art. It is certain that the ancient Egyptians possessed considerable chemical and metallurgical knowledge, although the origin of alchemy cannot with certainty be attributed to them. Several Grecians became acquainted with the writings of the Egyptians, and initiated in their chemical knowledge. The fondness for magic, and for alchemy more particularly, spread afterward among the Romans also. When true science was persecuted under the Roman tyrants, superstition and false philosophy flourished the more. The prodigality of the Romans excited the desire for gold, and led them to pursue the art which promised it instantaneously and abundantly. Caligula made experiments with a view of obtaining gold from orpiment. On the other hand, Diocletian ordered all books to be burned that taught to manufacture gold and silver by alchemy. At that time many books on alchemy were written, and falsely inscribed with the names of renowned men of antiquity. Thus a number of writings were ascribed to Democritus, and more to Hermes, which were written by Egyptian monks and hermits, and which, as the Tabula Smaragdina, taught in allegories, with mystical and symbolical figures the way to discover the philosopher's stone. At a later period chemistry and alchemy were cultivated among the Arabians. In the 8th century the first chemist, commonly said to be Geber, flourished among them, in whose works rules are given for preparing quicksilver and other metals. In the Middle Ages the monks devoted themselves to alchemy, although they were afterward prohibited from studying it by the popes. But there was one even among these, John XXII, who was fond of alchemy. Raymond Lully, or Lullius, was one of the most famous alchemists in the 13th and 14th centuries. A story is told of him that during his stay in London he changed for King Edward I a mass of 50,000 pounds of quicksilver into gold, of which the first rose-nobles were coined. The study of alchemy was prohibited at Venice in 1488. Paracelsus, who was highly celebrated about 1525, belongs to the renowned alchemists, as do Roger Bacon, Basilius Valentinus and many others. When, however, more rational principles of chemistry and philosophy began to be diffused and to shed light on chemical phenomena, the rage for alchemy gradually decreased, though many persons, including some nobles, still remained devoted to it. Alchemy has, however, afforded some service to chemistry, and even to medicine. Chemistry was first carefully studied by the alchemists, to whose labor and patience we are indebted for several useful discoveries, for example, various preparations of quicksilver, kermes, etc.

It is still impossible to assert anything with certainty about the transmutation of metals. Modern chemistry, indeed, places metals in the class of elements, and denies the possibility of changing an inferior metal into gold. Most of the accounts of such transmutation rest on

fraud or delusion, although some of them are accompanied with circumstances and testimony which render them probable. By means of the galvanic battery even the alkalies have been discovered to have a metallic base. The possibility of obtaining metal from other substances which contain the ingredients composing it, and of changing one metal into another, or rather of refining it, must therefore be left undecided. Nor are all alchemists to be considered impostors. Many have labored, under the conviction of the possibility of obtaining their object, with indefatigable patience and purity of heart (which is earnestly recommended by sound alchemists as the principal requisite for the success of their labors). Designing men, however, have often used alchemy as a mask for their covetousness, and as a means of defrauding silly people of their money. Many persons even in our days, destitute of sound chemical knowledge, have been led by old books on alchemy, which they did not understand, into long, expensive and fruitless labors. Hitherto chemistry has not succeeded in unfolding the principles by which metals are formed, the laws of their production, their growth and refinement, and in aiding or imitating this process of nature; consequently the labor of the alchemist is but a groping in the dark.

ALCIATI, al-chä'tē, **Andrea,** Italian jurist and poet: b. Milan, 8 May 1492; d. Pavia, 12 Jan. 1550. For many years an advocate in Milan, he treated the objects of legal science to keen criticism, and was founder of the so-called "elegant" school of law. He also wrote several antiquarian and historical essays, but his most popular work was the 'Emblems' (Milan 1522), epigrammatic poems on his contemporaries' virtues and vices. Of the numerous editions of this work several are chiefly sought on account of their wood-engravings. Editions of his 'Complete Works' in Latin (4 vols., Basle 1546–49); (6 vols., Lyons 1560–61); (4 vols., Frankfort 1617). Consult C. Mignault's 'Life of Alciati' (Milan 1584).

ALCIBIADES, ąl'sĭ-bī'ā'dēz, son of Cleinias, an Athenian of high family: b. Athens 450 B.C.; d. 404 B.C. His father, who died a few years after his birth, had greatly distinguished himself in the Persian wars, and had taken a prominent part in the expulsion of the Peisistratidæ. Alcibiades was a relation of Pericles, who was his joint guardian along with Ariphron. He was remarkable in youth for the beauty of his person, the dissoluteness of his manners, the determination of his character and the greatness of his abilities. He came under the influence of Socrates, who tried to lead him into the paths of virtue; but though their friendship was strengthened by mutual obligations, each having saved the other in battle, the passions of Alcibiades were too strong for advice, and little permanent effect was produced on his character. He acquired great popularity by his liberality in providing for the amusements of the people, and although guilty of many violent, extravagant and audacious acts, he had, after the death of Cleon, a political ascendency which left him no rival but Nicias. Both at first cultivated alliance with Sparta, to which Alcibiades had a hereditary partiality, but the Spartans trusting more to Nicias, he was offended, and induced the Athenians to break with Sparta and ally themselves with Argos, Elis and Mantinea (in the Peloponnesian war). In 419 he was chosen *strategos,* and led a small army into the Peloponnesus, with which some important operations were effected. In 415 he advocated the Sicilian war, and was chosen one of the leaders of the expedition appointed to conduct it; but before it sailed he was charged with profaning and divulging the Eleusinian mysteries, and mutilating the busts of Hermes which were set up in public all through Athens. He was permitted to take his place in the expedition, but was recalled before his plans could be accomplished. He made his escape and went to Sparta, where he was well received. He divulged the plans of the Athenians, and assisted the Spartans to defeat them. Sentence of death and confiscation was pronounced against him at Athens, and he was cursed by the ministers of religion. He induced the Athenian dependencies of Athens to revolt, and made alliance with Tissaphernes, a Persian satrap. Soon after he abandoned Sparta and took refuge with the Persian, ingratiating himself by his affectation of Persian manners as he had previously done at Sparta by a similar affectation of Spartan simplicity. He now began to intrigue for his return to Athens, offering to bring Tissaphernes over to the Athenian alliance. His intrigue led to the establishment of an oligarchy (the Four Hundred), but they did not recall him. The fleet, however, which was stationed at Samos declared in favor of a democracy and recalled him. The revolution was effected at Athens without the return of the armament, and the banishment of Alcibiades was canceled. He remained abroad, however, for some years in command of the Athenian forces, gained several victories, and took Chalcedon and Byzantium. In 407 B.C he returned to Athens, where all proceedings against him were canceled, but in 406, the fleet which he commanded having suffered a severe defeat, he was deprived of his command. He retired to the Thracian Chersonesus, where he made war with mercenaries on the Thracian tribes. On the establishment of the Thirty at Athens a decree of banishment was passed against him. He took refuge with Pharnabazus, a Persian satrap, and was about to proceed to the court of Persia when he was assassinated, probably through private revenge.

ALCINOUS, ăl-sĭn'ō-ŭs, said to have been king of the Præacians, in the island now called Corfu. See ULYSSES.

ALCIPHRON, al'si-frŏn, Greek rhetorician who flourished in the 2d century of the Christian era and attained celebrity through his series of more than a hundred imaginary letters purporting to be written by the very dregs of the Athenian population, including courtesans and petty rogues. Their importance in literature is due almost wholly to the insight they afford into the social conditions and manners and morals of the day. The letters from the courtesans (*hetairai*) are based upon incidents in Menander's lost plays, and the new Attic comedy was likewise drawn upon for material.

ALCIPHRON, or THE MINUTE PHILOSOPHER. See BERKELEY, BISHOP GEORGE.

ALCIRA, äl-thē'ra, Spain, a well-built and strongly-fortified town in the "garden" province of Valencia, on an island encircled by two arms of the river Jucar, some 25 miles from Valencia. It was founded by the Carthaginians. Pop. 22,000.

ALCMÆON, alk-mē'on, a son of Amphiaraus and Eriphyle, was one of the heroes who took part in the successful expedition of the Epigoni against Thebes. He was charged by his father to put his mother to death in revenge for her having urged her husband to take part in an expedition in which his foresight showed him he should perish. She had been gained over to urge this fatal course by a gift from Polynices of the fatal necklace of Harmonia. The matricide brought upon Alcmæon madness and the horror of being haunted by the Furies, but at Psophis he was purified by Phegeus, whose daughter he married, giving her the fatal present. But the land became barren in consequence of his presence, and he fled to the mouth of the river Achelous, the god of which gave him his daughter Callirrhoë in marriage. His new wife longed for the fatal necklace, and sent her husband to Psophis to procure it under the pretense of dedicating it at Delhi; but Phegeus, learning for whom it was really intended, caused his sons to murder the ill-fated Alcmæon.

ALCMAN, alk'măn, one of the earliest and greatest of Greek lyric poets, belonging to the 7th century B.C. He is supposed to have been a native of Sardis, in Lydia, and to have been taken as a slave to Sparta and was made teacher of the state choruses. Only small fragments of his odes remain. He used the broad, homely Doric dialect. His poems were love ditties, hymns, pæans, processional chants, etc. He was regarded as the founder of erotic poetry, and the bucolic poets considered him their predecessor. He was read widely even in the 2d century A.D., but his dialect was then considered harsh. Consult Bergk, 'Poetæ Lyrici Græci' (4th ed., Leipzig 1882); Smyth, H. W., 'Greek Melic Poets' (New York 1900); and a fragment discovered in 1896 and published in 'Oxyrhynchus Papyri' (Vol. I, No. 8).

ALCMENE, or **ALKMENE,** alk-mē'nē, in Greek mythology, the daughter of Anaxo and Electryon, King of Mycenæ. She became the mother of Hercules through Zeus, who took the form of her husband Amphitryon. Finally Zeus bade Hermes guide her to the Islands of the Blest, where she was happily united with Rhadamanthus.

ALCO, a small variety of dog, with a small head and large pendulous ears, found wild in Mexico and Peru, and also domesticated.

ALCOBAÇA, äl'kō-bä'sa, Portugal, a small town in Estremadura, 50 miles north of Lisbon, at the junction of the Alcoa and Baça; is celebrated for a magnificent Cistercian monastery, the richest in the kingdom. It was founded in 1148 by Don Alphonso I. The buildings include an early Gothic church, containing the tombs of some of the Portuguese kings, and a valuable library. Parts of the buildings are used for barracks. Pop. 1,600.

ALCOCK, ōl'kŏk, Sir **Rutherford,** diplomat: b. Ealing, 1809; d. London, 2 Nov. 1897. Educated as a physician, he served as surgeon with British troops in Spain and Portugal 1832-36; and was appointed consul at Fuchow 1844. On the way his services were requisitioned at Amoy, where, with Sir Harry Parkes, he succeeded in convincing the Chinese officials that treaty agreements were to be respected and kept. Transferred to Shanghai he showed courage and determination by proclaiming that English ships would pay no duties, and that 1,400 grain junks then waiting to sail would not be allowed to go until the murderers of some missionaries were seized and punished. Though only one British sloop of war was in the harbor at the time, his bold attitude succeeded. He was appointed first consul-general in Japan 1858, and created K.C.B. 1862. As minister at Peking (1865) he conducted many difficult negotiations with tact and success. Retiring in 1871, he devoted himself to medical charities, promotion of geographical studies and the furtherance of a knowledge of Japanese art. Works: 'Medical History and Statistics of the British Legion in Spain' (1838); 'Japanese Grammar' (1861); 'Capital of the Tycoon' (1863); 'Art and Art Industries in Japan' (1878).

ALCOFORADO, äl'kō-fō'răd-ō, **Marianna,** Portuguese nun and author: b. Beja 1640; d. 1723. She was betrayed and deserted by Noel Bouton, afterward Marquis de Chamilly and Marshal of France, who was in Portugal from 1665 to 1667, serving under Count Schomberg in the reorganization of the Portuguese army. Her five letters written to him between December 1667 and June 1668 have earned her an imperishable position in literature, owing to the poignancy of their self-analysis, their unconscious self-abandonment and the revelation through passionate spirituality of a pure, single-hearted, tender and hopeless affection. As human documents, spontaneous expressions of love, faith, hope and despair, the "record of a nature tortured into a cry of anguish," they possess that quality of immortal dignity, melancholy and charm, which never fails to arouse sympathy and interest. As 'The Letters of a Portuguese Nun,' they were published anonymously in Paris, in 1669, by Comte de Guilleragues, director of the *Gazette de France,* and while Chamilly was known as the recipient, it was not until 1810 that the much discussed identity of the author was revealed. Consult Prestage, E., 'The Letters of a Portuguese Nun' (Marianna Alcoforado) (3d ed., London 1903).

ALCOFRIBAS NASIER, al'kō'frĕ'bä nä'syā, pseudonym sometimes used by Rabelais (q.v.).

ALCOHOL. Origin of the word somewhat obscure. According to most authorities it is from the Arabic *al-koh'l, koh'l* being the finely-powdered black sulphide of antimony used in the East for painting the eyebrows. First used to signify this powder, it afterward stood for any fine powder obtained by trituration or sublimation; then for any essence or spirit, and lastly for the liquid to which it is now applied. In the latter part of the 16th century spirit dried over powdered carbonate of potash was called *spiritus alcolisatus;* but Kopp suggests

that this is a corruption of *spiritus alcalisatus*, signifying spirit that has been treated with alkali, and that alcolized (or alcoholized) spirit was then shortened to alcohol.

1. **Ethyl Alcohol.**— Unless otherwise qualified, "alcohol" is understood to mean the liquid known to the chemist as "ethyl alcohol," and to the trade as "grain alcohol," or "spirits of wine." It is colorless and inflammable, burning with a flame that is intensely hot but almost non-luminous. Most of the alcohol used in the arts is produced by the fermentation of sugars or starches. A thin paste is made from molasses, finely ground corn or potatoes or other natural products containing sugars or starches, and a small quantity of malt or other agent containing diastase (q.v.) is added. The mixture is then allowed to stand until the diastase has transformed the starch into dextrose (glucose). Taking the chemical formula of starch as $(C_6H_{10}O_5)_3$ for the sake of illustration, we may have either of the following reactions as the primary effect of the diastase:

$$\underset{\text{Starch}}{(C_6H_{10}O_5)_3} + \underset{\text{Water}}{H_2O} = \underset{\text{Dextrin}}{(C_6H_{10}O_5)_3} + \underset{\text{Dextrose}}{C_6H_{12}O_6}$$

$$\underset{\text{Starch}}{(C_6H_{10}O_5)_3} + \underset{\text{Water}}{2H_2O} = \underset{\text{Maltose}}{C_{12}H_{22}O_{11}} + \underset{\text{Dextrose}}{C_6H_{12}O_6}$$

Neither dextrin nor maltose is directly fermentable, but each slowly becomes further transformed into dextrose, as appears from the following equations:

$$\underset{\text{Dextrin}}{(C_6H_{10}O_5)_3} + \underset{\text{Water}}{2H_2O} = \underset{\text{Dextrose}}{2C_6H_{12}O_6}$$

$$\underset{\text{Maltose}}{C_{12}H_{22}O_{11}} + \underset{\text{Water}}{H_2O} = \underset{\text{Dextrose}}{2C_6H_{12}O_6}$$

The reduction to dextrose (glucose) being now complete, yeast is added, and the temperature is maintained at from 72° to 85° F. Under the influence of the yeast-plant (*Saccharomyces cerevisiæ* or *Torula cerevisiæ*) the dextrose then undergoes fermentation, alcohol and carbon-dioxide being the chief products, according to the equation:

$$\underset{\text{Dextrose}}{C_6H_{12}O_6} = \underset{\text{Alcohol}}{2C_2H_6O} + \underset{\text{Carbon-dioxide}}{2CO_2}$$

A certain amount of nitrogenous and mineral matter must be present, in addition to the starch and sugar, in order to furnish food for the yeast-plant. The next step in the process is to distil off the alcohol from the fermented product. This is usually done in a still heated by steam. One or more redistillations may be necessary in order to obtain the alcohol in a satisfactory state of purity and strength. The product of the original fermentation is weak in alcohol, but the subsequent distillations effect a great concentration, since alcohol is far more volatile than water and therefore passes off first. The British Pharmacopœia requires rectified spirits (produced as described above) to have a specific gravity of 0.838, which is equivalent to 84 per cent of alcohol by weight. The United States Pharmacopœia fixes the specific gravity at 0.820, which corresponds to 91 per cent of alcohol by weight. It is possible to obtain this latter degree of concentration by ordinary distillation; but it is not possible to free the alcohol entirely from water without distilling it with potassium-carbonate, quicklime, calcium-chloride or some similar substance possessing sufficient affinity for water to prevent the water from passing over. The best way to eliminate the last traces of water is to digest strong alcohol with quicklime for two hours at about 100° F., and then distil, rejecting the first and last portions of the distillate. The product is then subjected to the same treatment a second time, after which it will probably be free from water. Alcohol thus deprived of the last trace of water is termed "absolute" or "anhydrous" alcohol. Its chemical formula is $C_2H_5.OH$, and its specific gravity is 0.80625 at 32° F., and 0.79367 at 59° F. Absolute alcohol boils at 173.1° F., when the barometer stands at 29.92 inches (760 mm.). It freezes at about 200° below zero F., first becoming very viscid. Its low freezing-point has led to its use as a thermometric fluid for the measurement of low temperatures. Its specific heat is variously estimated, but is in the vicinity of 0.61. Absolute alcohol has a powerful affinity for water, and it is therefore used as an astringent, and (for certain purposes) as an antiseptic. When exposed to the air it quickly absorbs a sensible amount of aqueous vapor, and ceases to be "absolute." According to the experiments of Atwater, the human body is capable of oxidizing about two ounces of it per day, since this amount can be administered without any evidence of alcohol appearing in the excreta. Alcohol mixes with water in all proportions, and is extensively used as a solvent for substances that do not dissolve in water: notably for organic substances and for alkaloids and drugs. When absolute alcohol is mixed with water the volume of the mixture is considerably less than the sum of the volumes of the constituents. The specific gravity of such a mixture therefore cannot be deduced by any simple formula; but it has been found by direct experiment, and tabulated, for all possible mixtures and temperatures. The strength of a given mixture of alcohol and water may be found by observing the specific gravity of the mixture at a definite temperature by means of a hydrometer (q.v.) and then referring to the tables. The greatest contraction of volume observed upon mixing absolute alcohol and water occurs when 49.8 volumes of water are mixed with 53.9 volumes of absolute alcohol, both liquids being at 32° F. The volume of the mixture is then 100, instead of 103.7, as it would be if there were no contraction. Mendeléeff points out that this particular mixture corresponds to a possible compound having the formula $C_2H_6O.3H_2O$; but it has not been conclusively proved that such compound exists. An alcohol containing 49.3 per cent (by weight) of absolute alcohol is known in the arts and for excise purposes as "proof spirit." This term was originally intended to denote alcohol just strong enough to ignite gunpowder when burned upon it; but it was defined by law in the reign of George III of England to be spirit "such as shall, at the temperature of 51° F., weigh exactly twelve-thirteenth parts of an equal amount of distilled water" (Watts). At 60° F. proof spirit has a specific gravity of 0.920. A mixture stronger or weaker than this is said to be (respectively) overproof or underproof. Distilled liquors, such as whisky, brandy and gin, contain from 40 to 50 per cent of absolute alcohol, wines from 7 to 20, ale and

porter from 5 to 7, and beer from 2 to 10. Alcohol coagulates albumen, and, partly for this reason and partly because of its action in arresting the development of micro-organisms, it prevents the putrefaction of dead animal matter. The alkali metals attack absolute alcohol rapidly with the formation of compounds variously known as alcoholates, alcohates and alcoates, but more definitely and correctly as "ethylates." Thus alcohol may be regarded as water in which one atom of hydrogen has been replaced by a molecule of the organic radical ethyl, C_2H_5, and, water being H-O-H, the formula for alcohol may be written (C_2H_5)-O-H. An alkali metal, when it combines with alcohol, merely replaces the H at the right of this formula; and sodium ethylate (for example) is therefore (C_2H_5)-O-Na, or simply C_2H_5ONa. The commonest test for alcohol in small quantities consists in warming the suspected liquid (or its distillate) with caustic potash and iodine. If alcohol is present iodoform comes down after a time as a precipitate. In England the use of alcohol in the arts is permitted without the payment of an excise tax, provided the alcohol contains 10 per cent of methyl alcohol (wood spirit). Alcohol so treated is known as "methylated spirit," it is unfit for drinking and the methyl alcohol that it contains cannot be readily removed. Alcohol can be prepared directly from its elements as follows: Acetylene (q.v.), C_2H_2, will combine directly with hydrogen to form olefiant gas, C_2H_4; concentrated sulphuric acid will absorb olefiant gas with the formation of hydrogen-ethyl-sulphate, $C_2H_5.HSO_4$; and if the product so obtained is diluted with water and boiled, alcohol is formed in accordance with the equation:

$$C_2H_5.HSO_4 + H_2O = H_2SO_4 + C_2H_5.OH.$$

This process is of considerable theoretic interest, and is said to be in commercial use in Russia. Until carbide of calcium (from which acetylene is prepared) can be had more cheaply, however, it can hardly be successfully used in the United States. (See DENATURED ALCOHOL).

2. Wood Alcohol, or Methyl Alcohol.— A colorless, inflammable liquid, strongly resembling ethyl alcohol in its general properties. It burns with a flame resembling that of grain alcohol, but with sensibly less evolution of heat. It is far cheaper than pure grain alcohol, because there is no excise tax upon it; in many uses it may be substituted for grain alcohol with success, its solvent powers being very similar. It cannot be used internally, however, as it is of a poisonous nature, and has a peculiar selective action upon the optic nerve, in which it often induces a condition of permanent atrophy with consequent total blindness. Methyl alcohol is obtained by the dry distillation of wood. The process, as carried out in New York State, is substantially as follows: Hardwood is cut into cordwood size and allowed to season thoroughly, two-year-old wood being dry enough to yield excellent results. Beech, maple and birch are most commonly used, birch being the poorest of the three, because it yields a larger proportion of objectionable tarry matter. The seasoned wood is placed in retorts of cast iron or sheet steel, which are cylindrical in general shape, and large enough to hold rather more than half a cord each. A slow fire is then built under the retorts, its intensity being gradually increased as the distillation progresses, and regulated so that at the end of from 12 to 18 hours nothing remains in the retort but charcoal. The distillate is passed through a condenser, by which a portion is condensed into a watery fluid, while another and very considerable portion passes through in the form of a permanent, non-condensable gas. The non-condensable part consists largely of marsh gas, hydrogen, carbon-dioxide and carbon-monoxide, together with smaller amounts of acetylene and numerous other substances. No attempt is made to utilize this portion of the product except as fuel. The portion that condenses consists largely of acetic acid and methyl alcohol, together with acetate of methyl and acetone, and a considerable quantity of tarry matter. The condensed distillate is passed into settling-tanks, where it is allowed to remain until the greater part of the tarry matter has subsided. The lighter part is then drawn off and saturated with slaked lime to fix the acetic acid. A second distillation expels the methyl alcohol, which is recovered by means of a condenser and shipped to the refiners in iron tanks, being known to the trade in this form as "wood spirit." The acetate of lime remaining behind is then recovered by evaporation and spread out upon a heated floor to dry.

Acetate of lime, as it comes from the alcohol manufacturer, is brown in color, from the tarry impurities that it contains. It is used in the manufacture of acetic acid and the various acetates (notably those of iron and aluminum) that are used in dyeing and in printing upon cloth. The impure methyl alcohol, or "wood spirit," that is shipped from the factory to the refiner, usually contains 80 per cent of alcohol and 20 per cent of water. The yield of spirit of this strength varies greatly, according to the skill and care exercised by the manufacturer; but in the best plants it may be taken at from eight to nine gallons per cord of good wood. Crude wood spirit contains considerable empyreumatic matter as well as acetone, acetate of methyl and acetate of ammonia. Pure methyl alcohol may be prepared by saturating the crude spirit with fused calcium chloride ($CaCl_2$) and heating in a water-bath. Methyl alcohol combines with calcium chloride under these conditions, forming a compound which can be readily purified, and from which the alcohol can again be recovered by distilling with water. A final distillation over quicklime will give the alcohol in its anhydrous or "absolute" state. Pure methyl alcohol, free from water, has a specific gravity at 32° F. of 0.8101. Its chemical formula is $CH_3.OH$; it is the hydrate of the organic radical "methyl" (CH_3), being analogous in this respect to ethyl alcohol, which is the hydrate of the organic radical "ethyl" (C_2H_5). It boils at about 151° F. under ordinary atmospheric pressure.

3. Alcohol.— In organic chemistry, a member of a numerous class of compounds consisting of carbon, hydrogen, and oxygen, and derived from hydrocarbons containing an even number of hydrogen atoms by the substitution of one or more hydroxyl molecules (HO) for an equal number of hydrogen atoms. The alcohols, as thus defined, include the two substances described above, and also many others (such as glycerin) whose properties at first

sight appear to be radically different from those of either ethyl or methyl alcohol. Alcohols are classified as monohydric, dihydric, trihydric, tetrahydric, pentahydric and hexahydric, according as they contain one, two, three, four, five or six molecules of hydroxyl (OH). Thus ethyl alcohol, C_2H_5OH, is monohydric, while glycerin, $C_3H_5.(OH)_3$, is trihydric. In the present article only the monohydric alcohols will be considered. These are divisible into five general series as follows: (*a*) Those having the general formula $C_nH_{2n+1}.OH$; they are derived from the paraffins, C_nH_{2n+2}, by the substitution of one molecule of OH for one atom of hydrogen and are known as the "fatty alcohols." (*b*) Those having the formula $C_nH_{2n-1}.OH$. Allyl alcohol is the most familiar member of this series. Its formula is $C_3H_5.OH$. (*c*) Those having the general formula $C_nH_{2n-3}.OH$. No familiar example can be given. (*d*) Those having the general formula $C_nH_{2n-7}.OH$. This series is derived from the aromatic series of hydrocarbons, just as the first series given above is derived from the paraffins. Thus, when hydrogen peroxide, H_2O_2, acts upon benzene, C_6H_6, we have $C_6H_6+H_2O_2=H_2O+C_6H_5.OH$, the last expression in this equation being the formula of phenyl alcohol, or (as it is more familiarly known) carbolic acid. (*e*) Those having the general formula $C_nH_{2n-9}.OH$. Cholesterin belongs to this series. It will be evident that the complete discussion of even the monohydric alcohols would be impossible in the present place; hence in what follows attention will be confined to the fatty or paraffin series of monohydric alcohols, having the general formula $C_nH_{2n+1}.OH$. No less than 17 distinct members of this series are known, the first five, when they are arranged in order according to the number of carbon atoms they contain, being:

Methyl alcohol, $CH_3.OH$.
Ethyl alcohol, $C_2H_5.OH$.
Propyl alcohol, $C_3H_7.OH$.
Butyl alcohol, $C_4H_9.OH$.
Amyl alcohol, $C_5H_{11}.OH$.

The first two members of this series do not admit of any isomeric modifications; but the third member admits of one such modification and the following members admit of more than one. For example, propane has the formula $CH_3.CH_2.CH_3$, and an alcohol may be formed by substituting OH for any one of the H atoms in this formula. If a hydrogen atom at the end of the formula be replaced in this way, we shall obtain the same result whether the substitution be made at the right-hand end or the left; that much is evident from the symmetry of the formula. But if one of the hydrogen atoms in the central CH_2 be so replaced the alcohol thus formed may differ from the one previously obtained by an end substitution; and in fact experiment shows that two different alcohols do actually exist, both having the same formula C_3H_7OH. These are distinguished as "primary" and "secondary" respectively. In general, an alcohol is called "primary" if the carbon atom to which the OH is attached is itself attached to only one other carbon atom; it is "secondary" if the carbon atom to which the OH is attached is itself attached to two other carbon atoms; and it is "tertiary" if this carbon atom is attached to three other carbon atoms. If it is admitted that the quantivalence of carbon is never greater than four, it follows that no carbon atom can be attached to more than three other carbon atoms; hence every alcohol in the class under consideration must be either primary, secondary or tertiary. The various radicals with which hydroxyl (OH) is combined in the alcohols are collectively called alkyls. Thus CH_3 (methyl), C_2H_5 (ethyl) and C_3H_7 (propyl) are all "alkyls," and an alcohol may be briefly described as the hydrate of an alkyl. Other alkyl compounds are also known. For example, hydrochloric, hydrobromic, hydriodic or hydrofluoric acid, when allowed to act upon an alkyl hydrate, yields the chloride, bromide, iodide or fluoride of that alkyl. Thus: $CH_3.OH+HCl=CH_3.Cl+H_2O$; and $C_3H_7.OH+HI=C_3H_7.I+H_2O$. $CH_3.Cl$ is "methyl chloride" and $C_3H_7.I$ is "propyl iodide." The oxides of alkyls are called "simple ethers." (See ETHER). For example, $(C_2H_5)_2.O$ is ethyl oxide (or ether), often erroneously called "sulphuric ether" from the fact that sulphuric acid is used in preparing it. By the action of various acids upon alkyl hydrates (or alcohols), salts of these alkyls, entirely analogous to the metallic salts, are obtained. Thus acetic acid and ethyl alcohol react according to the equation:

$$C_2H_5.OH+CH_3.COOH=CH_3.COO(C_2H_5)+H_2O.$$
Ethyl hydrate — Acetic acid — Ethyl acetate — Water

This reaction is entirely analogous to the following familiar one relating to potassium:

$$K.OH+CH_3.COOH=CH_3.COOK+H_2O.$$

See ESTERS.

ALLAN D. RISTEEN.

ALCOHOL ENGINE. See INTERNAL COMBUSTION ENGINE.

ALCOHOLISM, a term applied to the symptoms produced by poisoning with ethyl alcohol (see ALCOHOL). Alcoholism may be *acute, subacute* or *chronic,* and in order to understand its phases a brief review of the more important features of the physiological action of alcohol is necessary. Locally alcohol is an irritant, and induces congestion and increased cellular activity. There appears to be some foundation for the popular view that taken before a meal alcohol increases the wish to eat, for although in any marked quantity it greatly reduces or altogether inhibits the action of the digestive ferments it is probable that the increased amount of gastric juice secreted under the influence of small amounts more than makes up for this effect. Some authorities maintain that while the alcohol remains in the stomach digestion is retarded, but that after absorption of the alcohol the process advances more rapidly than would otherwise have been the case. The most important effect of the administration of alcohol is manifested through the nervous system. There is no doubt that physiologically alcohol is always a poison. Its psychological effects, however, need special attention. Experiments show that tasks like the addition of columns of figures or reading series of disconnected syllables are performed less rapidly and more inaccurately when the person had taken moderate amounts of alcohol, though he usually feels increased self-confidence and is convinced

that the actually inferior work he is doing is especially good. It is in this way that alcohol often aids the after-dinner speaker, who by moderate amounts of wine is relieved of diffidence or embarrassment and is enabled to speak with a fluency apparently rarely at his command under ordinary conditions. It is probable that the capacity for muscular work also is only apparently augmented by alcohol, the slight increase in efficiency at the start being neutralized by the earlier onset of fatigue. According to modern observers alcohol has but little direct effect on the circulation, though there is some change in the distribution of the blood through dilatation of the peripheral vessels. Respiration is little if at all affected. The question of whether or not alcohol is a food has elicited much controversy, but the experiments of Atwater, Neumann and others show beyond doubt that a certain amount of alcohol can be completely burnt in the body and serve as a source of heat and energy. In this way a saving of other food stuffs is effected, and in this sense alcohol is undoubtedly a food. The view upheld by some of the older authors that alcohol has the power of lessening the oxidation of the tissues is, however, unfounded. The modern tendency is to regard alcohol not as a physiological stimulant but as a universal depressant. From the above it might be inferred that alcohol does not possess the traditional value ascribed to it in medicine, and to some extent this is true. On the other hand, there are many legitimate indications for its use that cannot be met by other drugs and few thoughtful clinicians would be willing to do without its aid. Alcohol is often used in popular medicine without a correct conception of its action. Contrary to general belief it does not raise the bodily temperature, but actually causes it to fall on account of the increased radiation of heat from the surface of the body accompanying the dilatation of the blood vessels of the skin. Consequently alcoholic drinks should not be taken before exposure with the idea of avoiding fatigue or chilling, though there is no objection to its use when the exposure is over and the individual has returned home wet or chilled through.

Acute alcoholic poisoning follows the taking of very large quantities of strong spirits in a short time, and is not often seen. The patient promptly becomes comatose, the face is congested or purplish, there is complete muscular relaxation, weak heart action and collapse, ending in death through paralysis of the heart or of respiration or both, unless medical aid is given.

Subacute alcoholism is the ordinary type of drunkenness or "intoxication" and produces different manifestations in different individuals. The first effect of moderate amounts of alcohol is to cause exhilaration, garrulity, indistinctness and incoherency of speech, blunting of the sense of touch, and loss of muscular control so that the patient is unsteady on his feet and staggers when he walks. Dizziness and disturbances of sight and hearing may also appear, and finally a deep lethargy and stupor supervene. On awaking, nausea, vomiting, headache and mental depression remind the sufferer of his debauch. In some individuals the stage of hilarity does not appear and quarrelsomeness and moroseness are manifested from the start. The insensibility of alcoholic intoxication to some extent resembles that attending certain grave disorders like apoplexy, epileptic coma, fracture of the skull or opium poisoning, and mistakes in diagnosis on persons found unconscious in the street are unfortunately not infrequent. The true state of affairs is often extremely difficult to recognize, and it is always wiser to treat doubtful cases as if the more serious trouble existed. The fact that the breath smells of liquor is of little value, as bystanders may have sought to aid a victim of other conditions in this way, or a man who has indulged in alcohol may also be suffering from some of the difficulties mentioned. Some persons instead of becoming stuporous pass into a condition of wild excitement and uncontrollable fury termed alcoholic mania, during which the most revolting crimes may be committed. In others convulsive seizures, or alcoholic epilepsy, may succeed the first stage. Dipsomania is a form of mental disturbance in which the patient is subject to attacks of irresistible craving for liquor, though in the intervals he may be quite rational and alcoholic beverages may even be repugnant to him. It is most frequently a manifestation of a compulsive neurosis, or a mild manic-depression psychosis. Delirium tremens is a state of nervous unrest sometimes following a protracted debauch, sometimes appearing in steady, but not necessarily excessive, drinkers, usually as the result of some physical or mental shock. There are distaste for food, intense restlessness, terrifying hallucinations and illusions and obstinate insomnia. The treatment of acute alcoholism comprises, first, elimination of the poison by washing out the stomach, purging, rectal irrigation with salt solution, and the Turkish bath; and secondly, the substitution of other stimulants such as ammonia, strychnine, caffeine, etc., until nourishment can be retained and strength returns. In delirium tremens the two great indications are to produce sleep and nourish the patient, problems that often tax the ingenuity of the physician to the utmost.

Chronic alcoholism is the result of long continued immoderate indulgence in alcoholic liquors and is a serious cause of disease. It is always due to mental causes. Nearly all the organs of the body are affected and exhibit a new growth of connective tissue. The blood vessels show the lesions of arterio-sclerosis, the heart is affected in a variety of ways, commonly becoming fatty and weak, the kidneys develop nephritis, the liver cirrhosis, and the stomach is the seat of a chronic catarrhal condition giving rise to nausea, vomiting and distaste for food. There are congestive and catarrhal changes in the respiratory apparatus; the bodily strength is decreased and there is a tendency to obesity. There is also marked involvement of the nervous system leading to complete mental and moral deterioration with loss of will power, loss of memory and incapacity for the responsibilities of life. Chronic alcoholics have lessened power of resistance to infectious diseases and readily break down under the stress of any mental or physical strain. The treatment of chronic alcoholism requires isolation of the patient, preferably in an institution. Some authorities advise immediate withdrawal of all alcohol, others recommend a more gradual process of "tapering off."

Which method is preferable depends on the individual case. Hypodermic injections of nitrate of strychnine form the basis of some of the courses of treatment. The use of atropine, physostigmine, pilocarpine, as drugs which control the disturbance of balance in the vegetative nervous system, which is characteristic in chronic alcoholic states, is advisable. (See CRIME; PAUPERISM; TEMPERANCE). Consult Cushny, 'A Textbook of Pharmacology and Therapeutics'; Jelliffe, S. E., 'The Mentality of the Alcoholic' (New York *Medical Journal,* May 1917); Jelliffe and White, 'Diseases of the Nervous System' (1917); 'Modern Treatment of Nervous and Mental Diseases' (1913); Kelynack, T. N., 'The Drink Problem' (New York 1907); Phelps, E. B., 'The Mortality of Alcohol' (ib., 1911). Consult also 'Economic Aspects of the Liquor Problem' (Boston 1899); "The Relations of the Liquor Traffic to Pauperism, Crime and Insanity," in 'Twenty-sixth Annual Report of the Massachusetts Bureau of Labor Statistics' (Boston 1895) and "Economic Aspects of the Liquor Problem," in 'Twelfth Annual Report of the United States Department of Labor' (Washington 1898).

KARL M. VOGEL, M.D.

ALCOHOLOMETRY, the process of estimating the amount of percentage of alcohol in spirits. Several methods are employed for this purpose, but the commonest consists in determining the specific gravity of the spirit. Every mixture of alcohol and water has a specific gravity of its own depending on the temperature and on the relative composition of the mixture. As liquors contains substances other than alcohol and water they must be carefully distilled before a test can be made. When the specific gravities of various mixtures have been determined, the composition of a sample is readily determined by finding its specific gravity and observing the temperature.

ALCORAN, ăl'kō-răn or ăl'kŏ-rän. See KORAN.

ALCORN, al'kern, **James Lusk,** American statesman: b. near Golconda, Ill., 4 Nov. 1816; d. 30 Dec. 1894. He was educated at Cumberland College; five years deputy sheriff of Livingston County, Ky.; member of the legislature 1843; in 1844 removed to Mississippi and began law practice and was in the Mississippi legislature 1846–65. He was a Scott presidential elector in 1852, declined a Whig nomination for governor 1857, and the same year was defeated for Congress by L. Q. C. Lamar. He founded the levee system in the State. In 1861 he was in the Secession Convention, and was elected brigadier-general, but Jefferson Davis refused his commission from political grudge. In 1865 he was elected United States senator, but not allowed to take his seat. In 1869 he was elected governor (Republican), but resigned on election to the United States Senate, where he served 1871–77. He was independent candidate for governor in 1873, but was defeated.

ALCOTT, al'kŭt, **Amos Bronson,** American philosopher and educator: b. Wolcott, Conn., 29 Nov. 1799; d. 4 March 1888. In 1823 he set up an infant school, teaching it by conversation; and it gained much local fame. In 1828 he removed to Boston, and till 1836 conducted a school of the same sort, exciting wide attention by his genius for teaching, his revolutionary methods, and his exaggerated respect for the infant mind. His system was disfavored by most people, and in 1836 he removed to Concord, Mass., thenceforth expounding reform views on all human subjects, society and theology, diet and education, politics, morals and metaphysics. He became an admired public lecturer in the great days of the lecture platform. In 1842 he visited England, where a Pestalozzian school near London had been named Alcott House. He returned with two English friends, one of which, Charles Lane, bought an estate in the town of Harvard, Mass., for a communistic settlement, and the others joined him; but it failed. Mr. Alcott lived in Boston for a while, but finally returned to Concord, where he spent the remainder of his life as a "peripatetic philosopher," as justly said: giving talks in different towns and cities on all human subjects when invited — first at random, but latterly formal, with printed topics and regular places and periods. The conversation was nominally open, and questions in order; but it was soon found better to let it be a monologue by Mr. Alcott, who was put out by interruptions and could not argue. The company lost nothing; for though entirely unsystematic, and having no set philosophy which could have been developed into a school, he was fertile in ideas of deep spiritual insight and noble loftiness, and many leaders of thought, as Emerson, acknowledged him as a source of some of their best inspirations. In this characteristic of intellectual scrappiness, yet great molding influence, he may be compared with Coleridge and St. Simon. He was a leader among the Transcendentalists; and that he was an ardent Abolitionist goes without saying. His grounds in Concord represented his independence of mind and whimsicality; they were fenced by himself with gnarled pine boughs of endless diversity of form, apparently picked up as he walked. He contributed 'Orphic Sayings' to the *Dial,* of Boston (1839–42), and published many scattered papers; 'Tablets' (1868); 'Concord Days,' recollections of that place (1872); 'Table Talk' (1877); 'Sonnets and Canzonets' (1877).

ALCOTT, Louisa May, American novelist, daughter of A. B. Alcott: b. Germantown, Pa., 29 Nov. 1832; d. Boston, Mass., 6 March 1888, two days after her father. She was two years old when her parents moved to Boston; eight when they went to Concord. Her father was her chief teacher, on the system of his famous infant schools; as the latter developed no other geniuses, probably nature was responsible for hers. Thoreau also taught her for a time. She had always creative facility and sense of literary form, and began writing in early youth; at first for pleasure, then at 16 for periodicals to help support the struggling family, whose mainstay she continued all her life, her father's superiorities not being of the money-making order. But for many years afterward she groped for her true field, starting with sensational stories of no permanent merit. For 10 years she was a school-teacher. In 1862 she went to Washington as a war hospital nurse and wrote letters thence to her mother and sisters; on her return in 1863 she recast these into a volume

entitled 'Hospital Sketches,' as the easiest available literary capital, not suspecting that she had found her kingdom. In these was first revealed her peculiar power of sketching commonplace people and scenes in all their commonplaceness, yet by the play of genial humor and rare selective art making them as charming as the best creations of the fancy. The success of these stimulated the publication of 'Little Women' (written 1867, after return from a year's European trip for impaired health, published 1868), which sold 60,000 copies the first year, and which still remains one of the best copyrights in American literature. It raised her at once and justly to one of the front places in American authorship, and remains the one work of hers the world would much regret losing. In formal art it has no merits; there is no structure and no climax, merely detached scenes of an uneventful life; little delicacy of touch, though there are passages of much tenderness and pathos; but the healthy sense and stereoscopic lifelikeness make it rather an addition to people's actual experiences than their memories of fiction; and the girls, despite the blunt portrayal of surface faults and even over-harsh lack of idealization, are loved like sisters by millions. It is the world-photograph of the New England home and the American girl. This was her great opportunity; her own family and friends to "compose" and adorn, with scant need for imagination, of which she had little, or plot, in which she was very deficient. After this, with the necessity of inventing a set story, and her personal life mostly wrought into her previous work, her limitations were strongly apparent: 'An Old-Fashioned Girl (1869), 'Little Men' (1871) and a series of later juveniles, though only less popular with the young than 'Little Women,' add nothing to her real reputation. They are also deformed by two unwholesome qualities: one derived from her father,— representing grown people mainly as vexatious interferences with children's enjoyment and the latter as quite capable of teaching wisdom to their elders; the other a proof how much feminine craving lay underneath her spinster life,— making love-sentiment a sauce to everything from the kindergarten up, and the world one vast scene of "philandering." But these pot-boilers had a higher motive and result than most money-earning, for they enabled her father to live his serene life. She adopted at different times a son of her sister, Mrs. John Pratt ("Meg") and the orphaned daughter of her artist sister, Mme. Nieriken ("Amy"); and kept house for them and her father in vigorous New England fashion, caring for the latter like a baby. Fatigue and excitement during his last hours laid her low with a fatal brain fever. Besides the books above mentioned she published 'Flower Fables or Fairy Tales' (1855); 'Moods' (1864, revised 1881); a series, 'Aunt Jo's Scrap Bag' (1871–82); 'Work, a Story of Experience' (1873); 'Eight Cousins' (1874); 'Rose in Bloom' (1876); 'Silver Pitchers' (1876); 'Under the Lilacs' (1878); 'Jack and Jill' (1880); 'Proverb Stories' (1882); 'Spinning-Wheel Stories' (1884); 'Lulu's Library' (1885).

ALCOTT, May (MME. ERNEST NIERIKEN), American artist, daughter of A. B. Alcott: b. Concord, Mass., 1840; d. 1879. She studied at the Boston School of Design, and under Krug, Rimmer, Hunt, Vautier, Johnston and Müller. Thenceforward she lived variously in Boston, London and Paris; after marriage chiefly in the last. She did good work in still-life painting, both oil and water-color, and copied Turner so ably that Ruskin had some of the work adopted for models at the South Kensington schools. She published 'Concord Sketches,' with a preface by her sister (1869); 'Art Studying Abroad' (1879).

ALCOY, ąl-kō'e, Spain, a town in Valencia, 24 miles north by west of Alicante, near the source of the Alcoy, in a hollow encircled by hills. There is a Roman bridge over the river and the town has a very picturesque appearance. Its chief manufacture is paper and it is famed for the *peladillas* or sugar-plums of Alcoy, Pop. 34,000.

ALCUIN, ăl'kwĭn, or **FLACCUS ALBINUS**, an Englishman, renowned in his age for learning; the confidant, instructor and adviser of Charlemagne. He was born probably in York in 735 and was educated under the care of Archbishop Egbert, and his successor Ælbert, with whom he went to the continent, and who afterward gave him the management of the school at York. Having gone to Rome to bring home the pallium (see PALLIUM) for Eanbert, the successor of Ælbert, Charlemagne became acquainted with him in Parma on his return; invited him, in 782, to his court and made use of his services in his endeavors to civilize his subjects. In the royal academy he was called *Flaccus Albinus*. To secure the benefit of his instructions Charlemagne established at his court a school, called *Schola Palatina*, or the Palace School, and intrusted him with the superintendence of several monasteries, in which Alcuin exerted himself to diffuse a knowledge of the sciences. Most of the schools in France were either founded or improved by him; thus he founded the school in the abbey of Saint Martin of Tours, in 796, after the plan of the school in York. He himself instructed a large number of scholars in this school, who afterward spread the light of learning through the empire of the Franks. Alcuin took his leave of the court in 801 and retired to the abbey of Saint Martin of Tours, but kept up a constant correspondence with Charles to the time of his death in 804. He left, besides many theological writings, several elementary works in the branches of philosophy, rhetoric and philology; also poems and a large number of letters, the style of which, however, is not pleasing and plainly betrays the uncultivated character of the age; nevertheless he is acknowledged as the most learned and polished man of his time. He understood Latin, Greek and Hebrew. The best edition of his works is that published at Ratisbon (1777, 2 vols.). Consult Lorenz's 'Life of Alcuin' (translated into English, London 1837).

AL'CYONA'RIA (from Gk. *alkyon[e]ion*, bastard-sponge), a sub-class of coral polyps (*Anthozoa*), including fan-corals, "dead men's fingers," organ-corals, the red coral used for beads and ornaments and others. Eight tentacles around the mouth and the eight cells into which the body is divided are the characteristic elements of this group. See CORAL; GORGONIA.

ALCYONE, the brighest star of the Pleiades (q.v.). Also see KINGFISHER.

ALDAN, a river of eastern Siberia, a tributary of the Lena, 1,200 miles in length, navigable for 600 miles. The Aldan Mountains run along parallel to it on the left for 400 miles.

ALDANA, Ramon, alda-na, rā-mōn', Mexican poet: b. 1832; d. 1882. Besides four dramas, among which are 'Honor and Happiness' and 'Nobility of Heart,' he produced lyric poems and sonnets and contributed articles to journals.

ALDBOROUGH, ald'bŭr'ō, or locally ā'brŏ, or **ALDEBURGH**, a small seaport and watering-place of Suffolk, 29 miles northeast of Ipswich by rail. It was disfranchised in 1832; but in 1885 it received a new municipal charter. It has a quaint, half-timbered moot hall; and in the church is a bust of the poet Crabbe, who described the place in his poem 'The Borough.' It has a two-mile promenade, golf links and lobster and herring fisheries. Pop. 2,400.

ALDEB'ARAN, a star of the first magnitude, forming the eye of the constellation Taurus or the Bull, the brightest of the five stars known to the Greeks as the Hyades. Spectrum analysis has shown it to contain antimony, bismuth, iron, mercury, hydrogen, sodium, calcium, etc.

ALDEGREVER, āl'de-grā'vĕr, or **ALDEGRAF, Heinrich,** German artist: b. Paderborn, Westphalia, 1502; d. Soest before 1561; the most important artist of Westphalia during the 16th century and one of the great names in German art. The story of his life can only be gathered from fragmentary allusions which tell us that he was the son of Hermann Aldegrever (the family name was really Trippenmeker, which the artist used in signing some of his works), that he became a citizen of Soest, where be was highly esteemed and where he died. The last date known on any work by him was 1555. Aldegrever was eminent as goldsmith, painter and engraver. In the first capacity he had such patrons as Duke Wilhelm of Cleve, and like most artists of his day, worked at various related branches of the craft (glass, small sculpture, etc.). His paintings are not numerous but of a very high standard. The 'Portrait of a Young Man' now in the Liechtenstein Gallery in Vienna, perhaps his masterpiece in this art, or the 'Young Man with the Pink' in the National Gallery of London, shows the German school at almost its best level; the scrupulous exactitude of observation and of workmanship being informed by a spirit of human appreciation and a real sensitiveness to design. Other paintings of high quality by the master are 'The Resurrection' at Prague and a 'Portrait of a Man' at Berlin. Aldegrever's greatest importance is as an engraver, the number of works attributed to him in this medium being 289 (Bartsch). There is a good collection in the British Museum. One of his earliest plates is a free copy after Dürer, and the influence of the master persists for some time and is most fruitful of good. "The greatest of all the 'Little Masters'," says W. B. Scott, "Aldegrever is the most worthy successor to Albert Dürer." His inventive power never fails and shows itself alike in purely ornamental designs, in landscape and in figure work, like the 'Wedding Guests' or the 'Melanchthon.' Aldegrever was apparently much stirred by the Reformation, and the gravity of its thought is translated by the severe and yet most vital treatment which he accords to lines and masses, to the human face and figure. Consult 'Die Nurnberger Kleinmeister' (Leipzig 1911).

ALDEHYDE ("dehydrogenated alcohol," or alcohol which has been deprived of a portion of its hydrogen), a substance intermediate in composition between a primary alcohol and the corresponding acid. When an alcohol (q.v.) containing the molecular group $CH_2.OH$ is acted upon by oxidizing agents, it loses two atoms of hydrogen from this group and becomes transformed into a substance which no longer contains the hydroxyl group (OH), and which is known as the "aldehyde" of the alcohol from which it was produced. In the laboratory aldehyde is formed by the oxidation of alcohol by air in the presence of platinum black or by manganese dioxide and sulphuric acid, and subsequent rectifying with calcium chloride. It may also be prepared by passing alcohol through an iron tube heated to 1,350° F. For commercial use it is collected from the first vapors which come over in the rectification of alcohol which has previously been filtered through charcoal. The largest yields are obtained from potato alcohol and from alcohol made from the juice of the sugar beet. The aldehyde is separated from the alcohol in a special still contrived for the purpose. If the formula of the original alcohol is $R.CH_2.OH$, that of the corresponding aldehyde is R.CO.H. Aldehydes combine with bisulphites (or acid sulphites), producing compounds that are usually soluble in water, but insoluble in a solution of a bisulphite. Hence if a solution containing an aldehyde is shaken with a saturated solution of a bisulphite (such as $HNaSO_3$), the aldehyde is all thrown down in the form of an insoluble compound, from which the aldehyde itself may afterward be liberated by treatment with dilute sulphuric acid and distillation by steam. Aldehydes are easily oxidized into their corresponding acids and on account of their affinity for oxygen they act as powerful reducing agents. An aldehyde may also be reconverted into the alcohol from which it was obtained, by the action of sodium amalgam. About 50 aldehydes are known, nearly all of which are volatile liquids.

The general relation of the aldehydes to their corresponding alcohols and acids may be illustrated by the following examples: The formula of methyl alcohol is $CH_3.OH$ or $H.CH_2.OH$. In the presence of platinum black, air oxidizes methyl alcohol in accordance with the following equation:

$$H.CH_2.OH + O = H_2O + H.CO.H.$$

H.CO.H (or CH_2O) is "formic aldehyde" or "formaldehyde." This rapidly absorbs oxygen and undergoes the change

$$H.CO.H + O = H.COOH.$$

Formaldehyde Formic acid

Again, if ethyl alcohol ($C_2H_5.OH$ or $CH_3.CH_2.OH$) is treated in the same manner (or better, if it is oxidized with a mixture of

potassium bichromate and sulphuric acid), we have

$$CH_3.CH_2.OH + O = CH_3.CO.H + H_2O.$$
Ethyl alcohol Acetic aldehyde

If allowed to absorb oxygen, acetic aldehyde then undergoes the further transformation

$$CH_3.CO.H + O = CH_3.COOH.$$
Acetic aldehyde Acetic acid.

Acetic Aldehyde or Acetaldehyde.— When not qualified in any way the term aldehyde is understood to mean acetic aldehyde, the substance whose formation from ethyl alcohol has just been described. It is found among the products of the dry distillation of sugar, in wines during the ageing process, in crude wood alcohol and in crude petroleum. Aldehyde (in this sense) is a colorless liquid with a suffocating smell, miscible in all proportions with water, alcohol and ether, boiling at 70° F. and having a specific gravity of 0.800 at 32° F. It is highly inflammable and burns with an almost non-luminous flame. It is capable of existing in several polymeric states, each having the same chemical composition as aldehyde, but differing from it in appearance and behavior. Thus although aldehyde may be preserved for a long time if kept in contact with excess of acid, in its pure state it soon deposits a solid substance in needle-like crystals known as metaldehyde, which sublimes at 240° F. without decomposition, and is reconverted into aldehyde when confined and heated to 260° F. By treatment with sulphuric or hydrochloric acid, aldehyde may be converted into a liquid known as paraldehyde, a colorless liquid which boils at 255° F., has a vapor density indicating the formula $3(C_2H_4O)$ and crystallizes in large transparent prisms at about 50° F.

Aldehyde is used for silvering mirrors and other objects, on account of the property that it possesses (in common with other aldehydes) of throwing down a deposit of bright metallic silver when heated with a concentrated ammoniacal solution of silver nitrate containing a little caustic soda.

ALDEN, âl'dĕn, **Bradford R.,** American soldier: b. Meadville, Pa., 1800; d. Newport, R. I., 10 Sept. 1870. Graduating at West Point 1831, he was instructor there 1833–40 after some camp and garrison life; then for nearly two years aide to Winfield Scott; after three years more of garrison duty was commandant at West Point 1845–52. Sent to the far West for service in the Puget Sound Indian troubles, in 1853 he organized and led an expedition against the Rogue River Indians of southwest Oregon; and in the fierce battle at Jacksonville 24 August, was permanently disabled and forced to retire from the army. He was a man of culture and fine literary tastes.

ALDEN, Henry Mills, American magazine editor and author: b. Mt. Tabor, Vt., 11 Nov. 1836. He was graduated in 1857 at Williams College, in the class with James A. Garfield and Horace E. Scudder; in 1860 at Andover Theological Seminary and received license to preach, but was never ordained. He settled in New York in 1861; was managing editor of *Harper's Weekly* 1863–69 and has been editor of *Harper's Magazine* since 1869. His earliest interests were classical, especially in regard to ancient thought, religion and literature; in the winter of 1863–64 he delivered 12 lectures at the Lowell Institute, Boston, on 'The Structure of Paganism'; his earliest writings published were two papers on the 'Eleusinian Mysteries,' in the *Atlantic Monthly;* and his classical scholarship is recognized as of a high type. In his editorial work he has sought to combine fresh intellectual outlook and the presentation of the latest results of scholarship with sound ethics and an elevating social tone; also to make the magazine American in the best sense and to bring forward new writers. He collaborated with A. H. Guernsey in 'Harper's Pictorial History of the Great Rebellion' (1862–65); and has written 'The Ancient Lady of Sorrow' (poem, 1872); 'God in His World' (1890, anonymous), a 'Study of Death' (1895), widely read and admired, and 'Magazine Writing and the New Literature' (1908).

ALDEN, (Mrs.) **Isabella McDonald** («Pansy»), American juvenile writer: b. Rochester, N. Y., 3 Nov. 1841. She was educated at Ovid and Auburn, N. Y., and while she has written fiction for adults and 'The Prince of Peace,' a life of Christ, her chief note is as the author of the 'Pansy Books,' Sunday-school juvenile novels, about 60 volumes in all; and as editor of the juvenile periodical *Pansy* (1873–96). She has since been on the staff of the *Christian Endeavor World* of Boston and the *Herald and Presbyter* of Cincinnati.

ALDEN, James, American naval officer: b. Portland, Me., 31 March 1810; d. San Francisco, Cal., 6 Feb. 1877. Becoming midshipman 1828, he accompanied the Wilkes expedition around the world 1838–42; commissioned lieutenant 1841, he served through the Mexican war in all the leading seaboard engagements. The Puget Sound Indian troubles called him thither 1855–56 for active duty. The Civil War found him in command of the steamer South Carolina, and he was sent to the Gulf and had a fight at Galveston, Tex.; later, in command of the sloop-of-war Richmond, he was at the passage of Forts Jackson and Saint Philip and the capture of New Orleans and Port Hudson. He became captain 1863 and commanded the Brooklyn in the battle of Mobile Bay (August 1864) and the assaults on Fort Fisher; commodore 1866, and given charge of the Mare Island (Cal.) navy yard 1868; in 1869 made chief of the bureau of navigation, and in 1871 promoted to rear-admiral and assigned to command of the European squadron. He was retired 1873.

ALDEN, John, of the Plymouth colony: b. England 1599; d. Duxbury, Mass., 12 Sept. 1687. His name is familiarized by Longfellow's poem 'The Courtship of Miles Standish.' He was originally a cooper of Southampton, was employed in making repairs on the Mayflower and came over in her with the Pilgrim Fathers. By some accounts he was the first to step ashore at Plymouth. He married Priscilla Mullens: the tradition is (as used by Longfellow) that he had previously pleaded the cause of Miles Standish. He was for over 50 years a colonial magistrate and highly esteemed for probity, sagacity and resolution. All the distinguished Aldens of the United States are his descendants.

ALDEN, William Livingston, American humorous writer and journalist: b. Williams-

town, Mass., 9 Oct. 1837; d. Buffalo, N. Y., 14 Jan. 1908. He introduced canoeing into the United States. He was for a time United States consul-general at Rome. He wrote 'Domestic Explosives' (1877); 'Shooting Stars' (1878); 'The Canoe and the Flying Proa' (1878); 'Moral Pirates' (1880); 'The Comic Liar' (1881); 'Cruise of the Ghost' (1882); 'Life of Christopher Columbus' (1882); 'A New Robinson Crusoe' (1888); 'Drewitt's Dream' (1902), etc. From 1900 he was London correspondent of the New York *Times*.

ALDENHOVEN, a town of Prussia, Rhine province; 12 miles northeast of Aix-la-Chapelle. Here the French, in 1793, under Dumouriez, were defeated by 50,000 Austrians under Prince Josias of Coburg, and were prevented from making their contemplated invasion of Holland.

ALDER, ăl'dĕr, the common name for a genus of plants (*Alnus*), of the family *Betulaceæ*. In the eastern United States several species are very common shrubs branching freely from the roots and forming dense-clumps along the banks of streams and in other wet places. On the west coast trees often attain a height of from 40 to 60 feet in favorable locations. It is found in temperate and cold regions. The wood of some species is very durable in the water, and therefore well adapted to mill-work, sluices, piles of bridges, etc. The bark and shoots are used for dye, and the branches for the charcoal employed in making gunpowder. The names black, red and white alder are often popularly applied to plants of other orders.

ALDER-FLY, a fly of the dipteran family *Sialidæ* (q.v.).

ALDERMAN, Edwin Anderson, American educator: b. Wilmington, N. C., 15 May 1861. He was educated at the University of North Carolina; was superintendent of the public schools of Goldsboro, N. C., 1884–87; assistant State superintendent of North Carolina, 1889–92; professor of English and history at the State Normal College, 1892–93; professor of education, University of North Carolina, 1893–96; president of University of North Carolina, 1896–1900; president of Tulane University of Louisiana, 1900–04; LL.D. the University of the South, Tulane University, Johns Hopkins University, Columbia University, Yale University, University of North Carolina, Williams College, Dartmouth College and Harvard University; member of General Education Board and vice-president National Education Association, 1903; member of Virginia State Geological Commission; member of Rockefeller Sanitary Commission; member of Virginia State Educational Commission; member of council of American Association for International Conciliation; member of Board of Visitors of United States Military Academy, West Point, 1893; member of executive council of American Civic Alliance; member of Maryland and Louisiana Historical societies; member of American Academy of Social Sciences; member of Century Club, New York city, 1912; director Southern Railway. Author: 'A Brief History of North Carolina,' 'Life of William Hooper,' 'Life of Jabez Lamar Monroe Curry,' 'Obligations and Opportunities of Citizenship,' 'Southern Idealism,' 'The Spirit of the South,' 'Sectionalism and Nationality,' 'The Growing South' and editor-in-chief of 'Library of Southern Literature.'

ALDERMAN, a title pertaining to an office in the municipal corporations of Great Britain and the United States. In the United States the powers and duties of aldermen differ in the various States and cities. As a rule they are elected by popular vote and constitute the source of municipal legislation.

ALDERMAN LIZARD, or **CHUCKWALLA,** nicknames in California for a fat-bodied lizard (q.v.).

ALDERNEY (French AURIGNY), an island belonging to Great Britain, on the coast of Normandy, 10 miles due west of Cape La Hague and 60 from the nearest point of England, the most northerly of the Channel Islands. It is about 4 miles long and 1¼ broad, having an area of fully 3 square miles. The coast is bold and rocky, the cliffs in many places rising from 100 to 200 feet in height. In the interior the soil is fertile producing excellent crops of corn and potatoes. About a third of the island is occupied by grass lands; and the Alderney cows are famous for the richness of their milk. The climate is mild and healthy. The town of Saint Anne is situated in a beautiful valley near the centre of the island. A judge, with six "jurats," chosen by the people for life, and 12 "douzaniers," representatives of the people, form a kind of local legislature; but the judge and jurats alone decide upon any measure, the douzaniers having only a deliberative voice. The French language still continues to prevail among the inhabitants, but all understand and many speak English. Alderney is well fortified. At Braye there is an extensive granite breakwater, built by the British government to help form a naval station and haven of refuge. The project was a failure. Alderney, Guernsey, Jersey and Sark are the only parts of the duchy of Normandy that have remained under the government of England since 1456. The Race of Alderney is a name given to the strait running between the coast of France and this island. Six miles northwest from Alderney are the Casquets, a cluster of rocks, on the largest of which is a lighthouse and a fog-bell. Pop. (1911) 2,561.

ALDERSHOT, ăl'dĕr-shŏt, **Camp at,** a permanent camp for the army in England, commenced in 1854 by the purchase on the part of government of an extensive tract of moorland known by the name of Aldershot Heath, lying on the confines of Surrey, Hampshire and Berkshire. The object was to accustom the officers and soldiers to act in brigades and divisions, and to familiarize them with the operations of a campaign by accustoming them to camp life, and exercising them in all the evolutions which they might be required to perform when brought into actual contact with the enemy. The Basingstoke Canal divides the camp into a North and a South Camp (otherwise known respectively as Marlborough and Stanhope Lines). The accommodation provided for the army consisted at first of wooden huts of the simplest construction; but these have been superseded by brick buildings, and

altogether the money expended on the camp has amounted to upward of $20,000,000. Until 1899 the Aldershot garrison consisted of troops available for service with the first army corps. It was later used by volunteers and militia for their annual training, and after the outbreak of the European War in 1914 vast numbers of raw conscripts were trained there before leaving for the battle fronts in Belgium, France and Macedonia. A town has sprung up in the neighborhood of the camp immediately beyond the government ground, on the edge of which the camp is established. The town of Aldershot is in Hampshire, to the south of the barracks. It contains several churches, hotels, numerous shops, and offers accommodation of various kinds, good and bad, to the soldiers; thus there are schools, newspapers, missions, literary institutes, music-halls, public-houses, etc. There is a fine equestrian statue of the Duke of Wellington. Pop. (1911) 35,175.

ALDHELM, an Anglo-Saxon scholar and prelate, bishop of Sherborne: b. 640 (?); d. 709. He was a great fosterer of learning and builder of churches, and has left Latin writings on theological subjects.

ALDINE, ăl'dĭn, **Editions,** the books printed by Aldus Manutius and his family in Venice (1490–1597). They comprise the first editions of Greek and Roman classics; others contain corrected texts of modern classic writers, as of Petrarch, Dante or Boccaccio, carefully collated with the MSS. All of them are distinguished for the remarkable correctness of the typography; the Greek works, however, being in this respect somewhat inferior to the Latin and Italian. The editions published by Aldo Manuzio (1450–1515), the father, form an epoch in the annals of printing, as they contributed in no ordinary measure to the perfecting of types. No one had ever before used such beautiful Greek types, of which he got nine different kinds made, and of Latin as many as 14. It is to him, or rather to the engraver, Francesco of Bologna, that we owe the types called by the Italians *Corsivi,* and known to us as italics, which he used for the first time in the octavo edition of ancient and modern classics, commencing with Virgil (1501). Manuzio's impressions on parchment are exceedingly beautiful; he was the first printer who introduced the custom of taking some impressions on finer or stronger paper than the rest of the edition — the first example of this being afforded in the 'Epistolæ Græcæ' (1499). From 1515 to 1533 the business was carried on by his father and brothers-in-law, Andrea Torresano of Asola, and his two sons — the three Asolani. Paolo Manuzio (1512–74), Aldo's son, possessed an enthusiasm for Latin classics equal to that of his father for Greek; and he was succeeded by his son, the younger Aldo (1547–97). The printing establishment founded by Aldo continued in active operation for 100 years, and during this time printed 908 different works. The distinguishing mark is an anchor, entwined by a dolphin, with the motto either of "*Festina lente*" or of "*Sudavit et alsit.*" The demand which arose for editions from this office, and especially for the earlier ones, induced the printers of Lyons and Florence, about 1502, to begin the system of issuing counterfeit Aldines. The Aldo-mania has considerably diminished in later times. Among the Aldine works which have now become very rare may be mentioned the 'Horæ Beatæ Mariæ Virginis' of 1497, the 'Virgil' of 1501, and the 'Rhetores Græci,' not to mention all the editions, dated and undated, from 1490 to 1497 which are now extremely rare. Consult Renouard's 'Annales de l'Imprimerie des Aldes' (1834), and Didot's 'Alde Manuce' (1873).

ALDINI, ąl-dē'nē, **Giovanni,** Italian physicist: b. Bologna, 10 April 1762; d. Milan, 17 Jan. 1834. A nephew of the famous Galvani and an accomplished linguist, he became widely known by his writings in Italian, English and French on the practical applications of galvanism, illumination, tides, fire prevention, etc. From 1734 to 1819 he was professor of physics at Bologna, was created Councillor of State and Knight of the Iron Crown by the Emperor of Austria and was founder of the school of natural science for working men at Bologna, which he endowed.

ALDOBRANDI'NI, the name of a Florentine family, latterly of princely rank (now extinct), which produced one Pope (Clement VIII) and several cardinals, archbishops, bishops and men of learning.

ALDOBRANDINI, Marriage, ăl'dō-bran-dē'nē, an ancient fresco painting belonging probably to the time of Augustus, discovered in 1606 and acquired by Cardinal Aldobrandini, nephew of Clement VIII, now in the Vatican. It represents a marriage scene in which 10 persons are portrayed, and is considered one of the most precious relics of ancient art.

ALDRED, or **EALDRED,** Anglo-Saxon prelate, bishop of Worcester and archbishop of York: b. 1000 (?); d. 1069. He improved the discipline of the Church and built several ecclesiastical edifices. On the death of Edward the Confessor he is said to have crowned Harold. Having submitted to the Conqueror, whose esteem he enjoyed and whose power he made subservient to the views of the Church, he also crowned him as well as Matilda.

ALDRICH, ăl'drĭch, **Nelson Wilmarth,** American legislator: b. Foster, R. I., 6 Nov. 1841. A farmer's lad, with only district-school education, he was clerk in a store from about 12 to 16; but, naturally studious and with a strong taste for mathematics, entered the East Greenwich Academy in 1857, and after graduation took a position in a large wholesale house in Providence, where he soon became a partner. In 1862 he was for nine months on garrison duty near Washington. In 1869 he was elected to the Providence common council, where he became a leader as expert in finance and business, and a dexterous manager without compromise of right, and was its president 1871–73. In 1875 he was elected to the legislature, and in 1876 was speaker of its house. In 1878 he was sent to Congress, taking his seat in 1879 (42d Congress); re-elected for the term 1881–83, he resigned in 1881, having been elected to the United States Senate on 4 October to succeed Gen. A. E. Burnside, and was re-elected in 1886, 1892, 1898 and 1904, practically without opposition in his party. In 1909 he successfully promoted the passage of the Payne-Aldrich tariff bill, passed by Congress

and signed by the President in 1910. His term as senator expired 3 March 1911; but he declined to stand for re-election and was succeeded by Henry F. Levintritt. During more than 20 years he has been known as one of the chief Republican leaders, an authority on finance and political economy, and a champion of protection; rarely taking part in debate, but powerful in legislative work, a member of committees on civil service and finance and chairman of the committee on rules for the 55th Congress. In 1911 Aldrich put forward a plan intended to increase the effectiveness of resources through their control by reserve associations, a scheme received with suspicion by the general public, though not unfavorably regarded by experts.

ALDRICH, Thomas Bailey, American author: b. Portsmouth, N. H., 11 Nov. 1836; d. Boston, Mass., 19 March 1907. He prepared for Harvard, but his father's death (1852) prevented a college career. Held editorial positions on the New York *Evening Mirror* and N. P. Willis' *Home Journal* till 1865. Edited *Every Saturday,* Boston, 1865–74, and *The Atlantic Monthly,* 1881–90. In prose and verse he held himself to the highest ideals of literary art and workmanship. He wrote: 'Cloth of Gold' (1874); 'Lyrics and Sonnets' (1880); 'Friar Jerome's Beautiful Book' (1881); 'Ballad of Baby Bell' (1856); 'Windham Towers' (1890); 'Unguarded Gates and Other Poems' (1895); 'Mercedes, a Drama' (1883); 'Story of a Bad Boy' (1870); 'Marjorie Daw and Other People' (1873); 'Two Bites at a Cherry, and Other Tales' (1893); 'A Sea Turn' (1902); 'Flower and Thorn'; 'Prudence Palfry'; 'The Queen of Sheba'; 'The Stillwater Tragedy'; 'The Sisters' Tragedy'; 'Judith and Holofernes'; 'Ponkapog Papers' (1903); 'Judith of Bethulia,' a tragedy in four acts (1905); etc. See STORY OF A BAD BOY, THE.

ALDRIDGE, Ira Frederick, American negro tragedian: b. (?); d. Lodz, Poland, 7 Aug. 1867. The discrepancies about his birth and training are monstrous and indicate invention on one side. One is that he was a mulatto, born near Baltimore about 1810, who picked up German from immigrants, became Edmond Kean's servant, and developed stage talent under him in England, returned and made a theatrical failure in Baltimore 1830–31, then went back to England and became famous. The other is that he was son of a full-blooded negro pastor in New York city (Greene Street Chapel), an immigrant Senegal chieftain converted and educated, who sent his son to Glasgow University to study for the same profession, despite a passion for the stage justified by successful amateur performances; but the boy (at this point the stories coincide) dropped theology and made his début at the Royal Theatre as Othello. He took at once, and Kean made him Othello to his Iago in Belfast. He played Shakespearean rôles in London till 1852, regarded as an excellent interpreter in all, but most liked in color-parts, such as Othello, Aaron in 'Titus Andronicus,' Rolla, Zanga, etc. He then played in Brussels and Germany 1852–55; the King of Sweden invited him to Stockholm in 1857. The Continent ranked him one of the foremost actors of the age, and the greatest sovereigns, with cities like Bern, showered honors and decorations on him and made him member of all sorts of learned societies. He married an Englishwoman. He was on his way to an engagement in Saint Petersburg when he died.

ALDROVANDI, āl'drō-vän'dē, Ulisse, Italian naturalist: b. Bologna, 11 Sept. 1522; d. 10 May 1605. He aroused interest in the natural sciences at a time when they had been long neglected, wrote profusely on natural history subjects, established the Botanical Garden of Bologna and, through his legacy to the Senate of Bologna of his collections, left behind him the germ of the great Bologna Museum. A short account of his life, together with a descriptive list of his published writings and manuscripts, may be found in 'Notizie degli Scrittori Bolognesi' (Vol. I, Bologna 1781). He was the first to collect an herbarium, in the modern sense of the word. He traveled widely, collecting plants and animals, and preparing himself to write a great work on the animal life of the world. Of this work four volumes on ornithology and one on mollusks were issued before his death, and 10 others, prepared by him from his material, were brought out afterward by his pupils and friends. Many of his manuscripts and drawings were preserved unpublished in the library of Bologna.

ALE and BEER, well known and extensively used fermented liquors, the best of which is prepared from barley after it has undergone the process termed malting. Beer is a more general term than ale, being often used for any kind of fermented malt liquor, including porter, though it is also used in a more special signification. "The numerous varieties of malt liquors met with in commerce may be resolved into three great classes — ale, beer, porter. Ale, as the term is generally understood, is a pale liquor brewed from lightly-dried malt, and abounding more or less in unfermented saccharine matter, dextrines, proteins, phosphates and the bitter and fragrant principles of the hop. Beer is a fine, strong, well-fermented liquor, darker, less saccharine and less alcoholic than ordinary ale. Porter is a dark-brown colored liquor, originally brewed from high-dried malt, but now generally made from pale malt, with a sufficient quantity of patent or roasted malt to impart the necessary color and flavor. Stout, brown stout, etc., are mere varieties of porter, differing from that liquor only in their superior strength and quality. East India ale, bitter ale, etc., of the great brewers, are beverages which combine the pale color and fragrant bitter of ale (the latter usually in undue excess) with the 'dryness' and maturity of beer. In London porter is called beer, and indeed in all parts of the kingdom the prevailing beverage of this kind consumed by the masses, of whatever class, commonly goes by the name of beer. The three great classes of malt liquor above referred to are, independent of mere differences of strength, excellence and commercial value, practically subdivided into an almost infinite number of varieties. Every county, every town and almost every brewer is distinguished by the production of a different flavored beer, readily perceived and highly appreciated by their respective votaries" ('Cyclopædia of Practical Receipts'). These differences depend chiefly on the quality of the materials and the

varying proportions in which they are employed, the temperature of the water used for mashing, the length of time the mash is boiled, the temperature at which fermentation is effected and the extent to which it is allowed to proceed. The color of the beer depends on the color of the malt and the length of time occupied by the boiling. The pale ale is made from malt dried at relatively low temperatures; the deep-yellow ale, from a mixture of pale, yellow and brown malt; and the dark-brown beer from malt that has been highly dried in the kiln and partly roasted, mixed with the paler sorts. Of all countries, Germany has been celebrated as a beer-drinking country from the earliest times. Many different kinds of beer are made there, among the most important being the Bavarian summer or lager (that is, store) beer, and winter beer, the Bavarian bock beer, Berlin white beer, wheat lager beer, Broyhan beer (Hanover), Merseburg brown beer, etc.

The manufacture of ale or beer is of very high antiquity. Herodotus ascribes the invention of brewing to Isis, and tells us that the Egyptians drank a liquor which they called *zuthos,* fermented from barley. Ale or beer was never used to a great extent in Greece or Italy, partly owing, no doubt, to the abundance of wine in these countries. Xenophon, in his 'Anabasis,' mentions it as being used among the inhabitants of Armenia, and the Gauls were also acquainted with it in early times. Ale or beer was in common use in Germany in the time of Tacitus. "All the nations," says Pliny, "who inhabit the west of Europe have a liquor with which they intoxicate themselves, made of corn and water (*fruge madida*). The manner of making this liquor is somewhat different in Gaul, Spain and other countries, and it is called by many various names; but its nature and properties are everywhere the same. The people of Spain, in particular, brew this liquor so well that it will keep good for a long time. So exquisite is the ingenuity of mankind in gratifying their vicious appetites that they have thus invented a method to make water itself intoxicate." Our Teutonic ancestors would of course bring with them from the Continent their national beverage, and accordingly we find ale mentioned in English history in very early times. It is mentioned in the laws of Ina, King of Wessex (680), and ale-booths were regulated by law in 728. It was customary in the reigns of the Norman princes to regulate the price of ale, and a statute passed in 1272 enacted that a brewer should be allowed to sell two gallons of ale for a penny in cities, and three or four gallons for the same price in the country. The use of hops in the manufacture of ale and beer seems to have been a German invention, and the name beer appears to have come from Germany to England with this practice (1524) after which "beer" and "ale" were used respectively for the hopped and the unhopped liquor. In 1552 hop plantations had begun to be formed in England. Ale-houses were first licensed in 1621, and in Charles II's reign duties amounting to 2*s.* 6*d.* a barrel on strong, and to 6*d.* on small ale or beer, were imposed for the first time (1660). From that time up to 1830, when it was entirely repealed, though the malt-tax remained, the duty on the barrel of strong beer varied, being in 1804 as high as 10*s.* Up to 1823 beer was classed into strong beer and small beer, the former being beer of the value of 16*s.* and upward the barrel, the latter beer below this value. See also BREWING.

ALEARDI, ä'lā-är'dē, **Gaetano Aleardo,** Italian poet and patriot: b. Verona, 4 Nov. 1812; d. there 17 July 1878. He was a pupil of Manzoni and early imbibed republican principles. He entered the legal profession, but having circulated some satirical couplets, was expelled from Venice by the Austrian government and took refuge in Paris. On his return to Italy his patriotic verses aroused his compatriots against Austrian domination. For his activity in the insurrection in Venetia in 1848 he was imprisoned at Josephstad, Bohemia, and did not regain his liberty until 1859, when he was at once elected deputy from Brescia. Later he became senator. He lived to see the realization of his life-long dream, of his own continued efforts, a united Italy. As a poet he has always been popular in Italy, his verses having awakened the youth of Italy to strive for the regeneration and unity of their country. Of his works the following are best known: 'Il Matrimonio' (1841); 'Arnalda di Rocca' (1842); 'Il monte Circello' (1844); 'Prime Storie' (1846); 'Une ora della mia giovinazza' (1858); 'Poésie volante' (1862); 'Canti patrii' (1862). His works have been issued in one volume, 'Canti' (6th ed., Florence 1882). His 'Epistolario' (correspondence) was edited by G. Trezza (Verona 1879). Consult Barbera, G., 'Memorie di un editore' (Milan 1883) and Bersezio, V., 'Il regno di Vittorio Emanuele II' (3 vols., Turin 1881).

ALECSANDRI, ä'lĕk-sän'drē, or **ALÈXANDRI, Vasile** (Basil), Rumanian song-writer and patriot: b. Bacau, 21 July 1821; d. Mircesti, 26 Aug. 1890. His publication of 'Poesii populare ale Românilor' (1853), drew attention to the great charm and lyric quality of Rumanian folk songs and ensured cordial appreciation of his own verse, 'Les doines' (1853); 'Doine si lacrimioare' (1863; 'Pastele' (1867); 'Legende' (1871); and 'Opere,' a complete edition of his works to date (9 vols., 1873–76). He also wrote the dramas 'Despot Voda' (1880); 'Fintina Blandusiei' (1884); and 'Ovidiu' (1885). A revolutionist and exile in early life, in 1859–60 he was Rumanian minister for foreign affairs; in 1879 was elected to the upper chamber and in 1885 became Rumanian minister at Paris.

ALEKSANDRA FEODOROVNA, Empress of Russia, consort of Emperor Nicholas I: b. 1 July 1798; d. 19 Oct. 1860. She was a daughter of King Frederick William III of Prussia and Queen Louise Charlotte Wilhelmine. Aleksandra Feodorovna's childhood belonged to the period of Prussia's downfall caused by Napoleon. After the defeat at Jena the Prussian royal family was constrained to move from one town to another and it was only after the Peace of Tilsit that it settled in Memel. On 15 Dec. 1809 the solemn entry of the royal family into Berlin was celebrated by great masses of people. On that occasion the Queen of Prussia taught her daughter how to share the calamities and joys of the people. When in 1814 Grand Duke Pavpovich came to Berlin

with his armies he was presented to Princess Charlotte and fell in love with her at first sight. The fair princess had confessed in a letter to her brother William her own love for the Russian grand duke and, after a long courtship she came to Saint Petersburg in 1817. The engagement took place on 25 June and the marriage on 1 July of that year. She had conceived a warm love for everything Russian, especially the language, history, folk-lore customs, etc. Professor Zhukovski had helped her considerably in her study of the language in which she showed remarkable progress. Until the ascent to the throne of Nicholas I her life flowed peacefully in the midst of her home: educating her children, cultivating music and singing, and exchanging a vast correspondence with her numerous friends. But afterward the circle of her activities became considerably broader In 1836 all the institutions founded by Empress Marie Feodorovna passed over to her care; she personally studied, superintended, increased and improved their scope. Some of them she reorganized radically. All the most important transactions, conducted by the state secretaries Villamov and Hoffman, had to be previously sanctioned by the wise Empress. In her later life she directed her attention to the education of young women and expended more than two-thirds of her enormous income on charities. Making a wholesome use of her immeasurable influence over her imperial consort, Aleksandra Feodorovna often softened the outbursts of his temper and unusual roughness which characterized the epoch after 1848. Her trips abroad were crowned by enormous diplomatic successes. She left in her adopted country an imperishable memory of a good-hearted, noble and modest woman. Consult Daragan, 'Vaspominaniya Kamer-Pazha' (*Russkaya Starina* 1875); A. T. von Grimm, 'Aleksandra Theodorovna, Kaiserin von Russland' (2 vols., Leipzig 1866).

ALEMAN, Mateo, ạ-lā-măn, Mă-tē-ō, Spanish novelist: b. Seville, September 1547; d. Mexico, about 1615. He was graduated at Seville in 1565 and in 1572 received an appointment to the royal treasury. He remained in this relation for 20 years and quitted it as poor as when he entered it. About 1609 it appears that he was established as a printer in Mexico. He wrote a poetical life of Saint Anthony of Padua in 1604 and 'Ortografhia Castellana' (Mexico 1609); 'Sucesos de D. Frai Garcia Gera, arzobispo de Mejico' (1613); 'Oracion Funebre,' of the same archbishop (1613). His great work is 'Guzman de Alfarache' (1599), a novel with a rogue for the hero. It shows a wide knowledge of human nature. The hero exhibits all the resources of a consummate rascal in the various characters he assumes. The work attained great popularity and was translated into French and Italian. For the text of 'Guzman' see Aribau's edition in 'Biblioteca de autores españoles' (Vol. III, Madrid 1846); Cvador's edition in 'Biblioteca Renacimiento' (Madrid 1913). Consult Chandler 'Romances of Roguery' (New York 1899); De Haan, 'The Novela Picaresca' (Baltimore 1900); and 'Discursos leidos ante la Real Academia Española por los excmos senores D. Francisco Rodriguez Marin, y D. Marcelino Menendez y Pelayo, en la recepcion publica del primero' (Seville 1907; the first discourse is devoted to Aleman). See GUZMAN DE ALAMANNI.

ALEMANNI. See ALAMANNI.

ALEMBERT, d'ạ'lān-bĕr, **Jean le Rond d',** French mathematician and philosopher: b. Paris, 16 Nov. 1717; d. there 29 Oct. 1783. The illegitimate child of Chevalier Destouches-Canon and the celebrated Madame de Tencin, sister of the archibishop of Lyons, he was abandoned in infancy near the church of Saint Jean de Rond, a fact from which his Christian name was derived. After he had attained eminence his father recognized him and gave him a pension. While still very young he displayed such precocity of talent that he was placed in the College Mazarin, where he became deeply interested in mathematics and philosophy and, in fact, while he attempted to study both medicine and law, his inability to turn his mind to either of these professions determined him to become a mathematician. In 1740 he was admitted to membership in the Academy of Sciences and a year later he published his celebrated 'Treatise on Dynamics.' Other scientific work followed rapidly, and in 1750 he became associated with Diderot in the publication of the 'Encyclopedia,' for which he wrote the introduction, the article on mathematics and many of the biographies. In 1754 he became a member of the French Academy, and in 1772, having declined several pressing invitations to become royal tutor at the court of Russia, he was elected perpetual secretary of the academy. His 'Elements of Philosophy,' in which he followed the principles of Locke to their ultimate conclusion, both in skepticism and materialism, had appeared in 1759. Two editions of his works have been published: Paris 1805, 18 vols., and Paris 1821, 5 vols.

ALEMTEJO, ā'lĕn-tā'zhŭ, Portugal, a southern province, extending eastward from the Atlantic Ocean to Spain, and bounded north by Beira, south by Algarve. Area, 9,431 square miles. The chief physiographical features are: the rivers Guadiana, Tagus and Sadão; the Algarvian Mountains on the south, 4,000 feet high; the hot, dry and barren plains of the south and west and the fertile, grazing and well-cultivated agricultural region on the east. Alemtejo is the largest, but the least populated, province of Portugal. The chief towns, giving their names to administrative districts, are Evora (the capital), Portalegue and Beja. Three lines of railway give intercommunication with Spain. Pop. 480,000.

ALENCAR, ä'lạn-kär', **Jose Martiniano de,** Brazilian jurist and novelist: b. Ceara, 1 May 1829; d. Rio de Janeiro, 12 Dec. 1877. Although prominent in his profession he is best known as a writer of fiction, his most popular works being 'O Sertanejo,' 'Iracema' and 'O Guarany,' all of which are stories of local Indian and colonial life.

ALENÇON, ä'lăn-sôn', France, city, capital of the department of Orne, on the Sarthe, 115 miles by rail southwest of Paris. Anciently celebrated for manufactures of point d'Alençon lace and diamonds, these are now comparatively unimportant, replaced by manufactures of woolens, linens, embroidery, straw hats, leather and vehicles. An important trade is also carried on in Norman horses, grain and granite

of the neighborhood. A clean well-built town, notable buildings are the circular corn market, the cloth market, the 15th century cathedral and the three remaining towers of the ancient castle of the royal dukes d'Alençon, restored and used as the city hall. Pop. 17,500.

ALENIO, ä'lā'-ne'ō. **Giulio,** Italian Jesuit missionary and author: b. Brescia 1582; d. Fu-chow 1644. From 1614, he led a remarkably active life in China during 30 years, adopting the native dress and customs, preaching the Gospel in the provinces of Kans-si and Fo-Kien and building several churches. He wrote numerous works in Chinese, notably a 'Life of Christ' which was published (8 vols., Pekin 1635–37) and has often been reprinted (3 vols., 1887) and 'The True Origin of All Things,' a cosmography of 10,000 titles which refuted the principal errors of Chinese belief (6 vols., Hangkow 1623). He was also distinguished as a mathematician and is author of 'Résultat de l'observation sur l'éclipse de la lune du 8 Novembre, 1612, faite à Macao' and published in the 'Mémoires de l'Académie des Sciences' (Vol. VII, p. 706).

ALEPPO, Turkey in Asia, city, capital of Aleppo vilayet, traversed by the Kuwek River, about 80 miles east of the Mediterranean and 70 miles west of the Euphrates, 60 miles east of Antioch. A branch line connects with the Beirut-Damascus line south to Rayak. Aleppo is a city of great historic interest and of Arab tradition dating back to the days of Abraham. The older portion of the city still surrounded by ruins of a Saracenic wall three miles in circuit is thoroughly Oriental in type with extensive bazaars, khans and numerous mosques. The European and Christian colony live in the new Azzizieh quarters outside and the Jews in the Bahsita quarter. On a hill to the northwest stands the citadel, and along each side of the river beautiful gardens extend for several miles. Aleppo for centuries was the centre of the great caravan trade between Bagdad and Damascus, and still carries on an important export and import trade in Oriental and European merchandise. It is the commercial metropolis of northern Syria, with manufactures of silks, carpets, woolens, cotton goods, leather, etc., and is the residence of consular agents of leading countries and the seat of European and American Catholic and Protestant missions, of Greek and Armenian patriarchs and of a Maronite bishop. Area of vilayet of Aleppo, 33,436 square miles; pop. 996,000; pop. of city of Aleppo, 150,000.

ALERT. See ESSEX AND ALERT.

ALESIA, ä-lā'shĭ-ą, France, a hill of the Côte d'Or, now Mont Auxois, rising above the village of Alise Ste-Reine, six miles south of Montbard, famous for the strongly fortified Gallic encampment, where Vercingetorix made his last stand against Cæsar and was defeated, thus ending the conquest of Gaul. The place became a considerable city under the Romans, but was destroyed by the Normans in 864. The site has been the subject of considerable archæological controversy, discussion and excavation. A colossal statue of Vercingetorix, erected by Napoleon III, stands on Mont Auxois. Consult Cæsar, J., 'De Bello Gallico' (Vol. VII); Rossignol, M., 'Alise, étude sur une campagne de Jules César' (Paris 1856).

ALESSANDRIA, ä'lĕs-sän'drē-a, Italy, fortified city and capital of Alessandria province, Piedmont, on the Tanaro River, 46 miles southeast of Turin. A junction of the principal railway lines of eastern Italy, it has great strategic and commercial importance, manufacturing textiles, clothing, hats, candles, etc., and carrying on a brisk trade in agricultural products. Notable buildings are: the old castle, the cathedral rebuilt in the beginning of the 19th century, the Academy of Sciences and Arts, founded 1562, and the royal palace. The citadel and extensive military barracks are on the opposite bank of the river at the confluence of the Bormida and are connected by a bridge. Alessandria was founded in 1168 by the Lombard League to resist German invasion, was besieged in 1657, 1707 and 1800 by the French and in 1815 had its fortifications destroyed by the Austrians. Since reconstructed, Alessandria, now is, after Verona the strongest fortified city of Italy. Area of province, 1,985 square miles; pop. 850,000. Pop. of city, 72,000.

ALESSANDRIA, Armistice of, the armistice under which the Austrian general, Melas, retired after the celebrated battle of Marengo, 16 June 1800. By this act General Melas abandoned to Napoleon every fortification in northern Italy west of the Mincio, a result which, according to the opinions of the historians, was a more serious blow to the Austrian cause than an unconditional surrender would have been.

ALESSANDRO STRADELLA, a romantic opera in three acts by Friedrich von Flotow (1812–83). It contains some beautiful melodies of a soothing charm all their own, while the plot is extremely simple, without any attempt at sensationalism. It was composed in Paris in 1844. The hero, Stradella, is a famous Venetian singer, in love with Leonore. Her uncle and guardian, a wealthy citizen named Bassi, watches closely over her, for he wants to marry her himself. But Stradella carries her off and they are married in a village near Rome. Bassi sends a bandit, Malvolio, to discover their whereabouts. At the door of the villa where the lovers reside, Malvolio meets another villain, his friend Barbarino, on the same errand as himself. Together they decide to kill Stradella and abduct his wife. Disguised as pilgrims they are welcomed in the Stradella home, where they are so charmed with the behavior and singing abilities of their host that they abandon their intention. Bassi next offers them such a high price that they promise to stab Stradella at his next performance. While lurking for their victim. Stradella so touchingly sings a hymn of the Holy Virgin's mercy to sinners that the would-be murderers throw away their daggers, fall on their knees, and join in the refrain. By the same means, Stradella finally conciliates also his wife's uncle, and they all become friends.

ALESUND, ä'lĕ-sūn, a town on the western coast of Norway, rebuilt and modernized after a disastrous fire in 1904 destroyed the old town. Its chief industry is codfishing. Pop. about 14,000.

ALETIA. See COTTON INSECT PESTS.

ALEURITES, ą-lū'rītz, a genus of trees of the family *Euphorbiaceæ,* consisting of four species, natives of eastern Asia and the islands of the Pacific. All the species are cultivated in tropical countries for the oils obtained from the seeds These oils (kekuna, bankul, tung or wood oil) are similar to linseed oil, but are superior to it in some respects. They are used largely in the manufacture of paints, soaps, etc. The trees have been extensively introduced into the southern United States with the hope of establishing a wood oil industry in this country.

ALEUPONE, ą-lū'pōn, a substance rich in nitrogen, found in the cells of seeds. In the legumes it is found imbedded in the grains of starch, but in grains it constitutes the inner nodule. It is sometimes called gluten (q.v.).

ALEUTIAN, Islands, ą-lū'shan, a chain of about 80 small islands belonging to Alaska Territory, separating the sea of Kamchatka from the northern part of the Pacific Ocean and extending nearly 1,600 miles from east to west between longitude 172° E. and 163° W.; total area, 6,391 square miles. Pop. about 3,000. They are of volcanic formation, and in a number of them there are volcanoes still in activity. Their general appearance is dismal and barren, yet grassy valleys capable of supporting cattle throughout the year are met with, and potatoes, turnips and other vegetables are successfully cultivated. They afford also an abundance of valuable fur and of fish. The natives belong to the same stock with those of Kamchatka. They are a strong, hardy race, capable of enduring extremes of heat and cold. They are nominally Christianized, and are connected with the Greek Church of Russia. See ALASKA.

ALEWIFE (possibly from *aloofe,* its Indian name), a small anadromous fish (*Pomolobus pseudoharengus*) found abundantly along the east coast of the United States, except at the extreme north and south. Somewhat earlier in the spring than its relatives it goes up the rivers in multitudes to spawn. It has made its way into some of the inland lakes in western New York where it is landlocked (var. *lacustris*). It exists in great abundance in Lake Ontario where it is not uncommon to find immense schools floating dead on the surface and alongshore. The eggs, which are voided in vast quantities, sink to the bottom and stick to rocks, etc. It is closely allied to both the herring and the shad, but it most resembles the shad in shape and color, though it is only from 8 to 10 inches long. It is less esteemed for its quality than the shad, but is of great importance as a food fish, and is taken by millions annually. This fish is called "gaspereau" in Saint Lawrence Bay, and "branch-herring," "ellwife" and "sawbelly" locally elsewhere; but the "alewife" of Bermuda is an entirely different fish, the round pompano. Several varieties of the alewife are of very inferior food quality but are captured and used as fertilizer.

ALEXANDER, a name of various ancient writers, philosophers, etc. (1) ALEXANDER of Ægæ: a peripatetic philosopher of the 1st century A.D.; tutor of Nero. (2) ALEXANDER the Ætolian; a Greek poet who lived at Alexandria about 285–247 B.C., reckoned as one of the seven poets constituting the tragic pleiad. (3) ALEXANDER of Aphrodisias, surnamed "Exegetes"; lived about 200 A.D.; a learned commentator on the works of Aristotle. (4) ALEXANDER CORNELIUS, surnamed Polyhistor, of the 1st century B.C. He was made prisoner during the war of Sulla in Greece and sold as a slave to Cornelius Lentulus, who took him to Rome, made him the teacher of his children and restored him to freedom. The surname Polyhistor was given him on account of his prodigious learning. The most important of his voluminous works was one in 42 books, containing historical and geographical accounts of nearly all the countries in the ancient world. (5) A Greek rhetorician and poet, surnamed Lychnus; lived about 30 B.C., wrote astronomical and geographical poems. (6) ALEXANDER NUMENIUS; a Greek rhetorician and teacher of elocution, of the 2d century A.D., two of whose works are historically known. (7) ALEXANDER the Paphlagonian; a celebrated impostor who lived about the beginning of the 2d century A.D., obtained a great influence with the people as an oracle; pretended to be Æsculapius reappeared. Lucian chiefly has made him known to us. (8) A Greek rhetorician of the 2d century A.D., surnamed Peloplaton, who vanquished Herodes Atticus in a rhetorical contest. (9) ALEXANDER PHILALETHES; a physician of the 1st century B.C., who succeeded Zeuxis as president of the famous Herophilean school of medicine. (10) SAINT ALEXANDER (d. 326 A.D.); the Patriarch of Alexandria from 312 A.D.; an opponent of Arius; member of the Council of Nice (325 A.D.); commemorated in the calendar 26 February. (11) ALEXANDER of Tralles; an eminent physician of Lydia, of the 6th century A.D.; author of two extant Greek works.

ALEXANDER, the name of eight Popes.

1. Alexander I, bishop of Rome about 109 A.D., recorded on the list of Popes by all the chronicles except Optatus Milevitanus. He confirmed, some say introduced, the rite of using unleavened bread for the Eucharist, of blessing water with salt, and certain rubrics in the mass. He died a martyr's death.

2. Alexander II, Anselmo Baggio, a native of Milan; he lived for some time at the court of Henry III, and in 1056 or 1057 became bishop of Lucca. In 1059 he became papal legate at Milan, and 1 Oct. 1061, through the zeal of Hildebrand, he was raised to the papal throne, consequently the imperial party elected Bishop Cadaloüs of Parma, a rival Pope, as Honorius II. Alexander was driven by him in 1062 from the vicinity of Rome. He then withdrew to Lucca, and on the decision of the contest by Bishop Burchard of Halberstadt he was sent by the German court to Italy and recognized as Pope. At the Council of Mantua in 1604, with the assistance of Anno of Cologne, he got possession of Rome against his rival. His reign, under the influence of Hildebrand, carried out the reform of the churches and their emancipation from secular control. When Henry IV wished a divorce from his wife Bertha, Alexander, through his legate, Cardinal Pietros Damiana, decided against him and summoned the King to Rome to answer for his crimes, but shortly after he died, 21 April 1073.

3. Alexander III (d. 1181), Rolando Ranuci; Pope, 1159–81. His career is histori-

cally important because of his vigorous prosecution, in opposition to Frederick Barbarossa, of the policies begun by Hildebrand. Three anti-Popes Victor IV, Pascal III and Calixtus III had been confirmed in succession by the Emperor. Alexander succeeded, and after the decisive victory at Legnano compelled Frederick's submission. The papal struggle was carried on in England by Thomas à Becket, ending in a victory for Alexander. William the Lion, of Scotland, was excommunicated for opposing him. Important decrees were issued by Alexander III, safeguarding ecclesiastical powers and privileges

4. Alexander IV, Pope 1254–61; a man of great gifts, which, however, were of little avail in his unfortunate times. His administration is signalized by attempts to unite the Greek and Roman Churches, and the establishment of the Inquisition in France (1255). He was the nephew of Gregory IX. In his battle with Manfred of Sicily, he suffered bitter humiliations and, deserted by his bishops, was obliged to escape from Rome. He died in Viterbo in 1261.

5. Alexander V, Pietro Philargi, of Candia. He was for some time professor in Paris, and in 1402 was made archbishop of Milan, and in 1404 cardinal. In 1409 after the deposition of the rival Popes, Gregory XII and Benedict XIII, he was elected Pope by the cardinals at the Council of Pisa, but was recognized by only a part of Christendom. He forbade the teaching of Wyclif in Bohemia and prohibited Huss from preaching even in private chapels. He died at the age of 70, and it was supposed by some, though without foundation, that he was poisoned by his successor, Balthasar Cossa (Pope John XXIII).

6. Alexander VI, Roderick Llançol, was born at Cativa in the diocese of Valencia, in Spain, 1 Jan. 1431. He assumed the name Borgia when his uncle of that name became Pope as Calixtus III. After studying law he entered the papal court and was advanced rapidly, becoming commendatory archbishop of Valencia, cardinal deacon and vice-chancellor of the Church in Rome. Appointed cardinal-bishop of Albano in 1476, he was ordained priest in that year. By the unanimous consent of the cardinal electors he was crowned Pope 11 Aug. 1492. His administration was a remarkable one. He cleared Rome of the bandits who had infested the city; held court every Wednesday; established the Congregation of the Index for the censorship of books; repressed the insolence and rapacity of the Roman nobility; put a stop to the falsification of ecclesiastical documents; drew up measures for the reformation of ecclesiastical discipline; co-operated with European rulers in their projects against the inroads of the Saracens; effected peace between the kings of Spain and Portugal by repartitioning between them their discoveries in the New World; provided missionaries for preaching the gospel in newly explored countries; approved and confirmed several religious congregations; restored discipline in the Church in Flanders; suppressed magic in Germany and Bohemia; popularized the custom introduced by Calixtus III of saying the Angelus at midday; encouraged arts, particularly painting and literature; put an end to the famines which had so often visited Rome; and issued many noted bulls, letters and other papal documents, which alone show that he was a man of extraordinary genius and power. He is charged by historians like Guicciardini and Burchard, and more modern writers who follow them, of licentiousness before his ordination to the priesthood, of simony, nepotism and cruelty as Pope. It is difficult to reconcile all the crimes attributed to him with his high qualities and distinguished deeds. Of late years the tendency of moderate historians is to exonerate him from many extreme charges, to extenuate the faults of his youth and cast doubt on the serious accusations brought against him as Pope.

7. Alexander VII, Fabio Chigi, of Siena, was, during the treaties of peace at Münster and Osnabrück, papal nuncio in Germany. He was chosen Pope 7 April 1665, through the influence of France. In 1161, in spite of the protests of the Jansenists, he confirmed the condemnation of the five Jansenist dogmas which had been condemned by his predecessor, Innocent X. Later he fell into controversy with Louis XIV. During his rule Rome was beautified in many directions, especially by the colonnade before Saint Peter's. He was himself a poet and friend of the arts and sciences. A collection of his poems appeared in 1656.

8. Alexander VIII (1610–91), Pietro Ottoboni, of Venice; Pope 1689–91; assisted Italy in wars against the Turks. Through the purchase of the library of Queen Christina of Sweden he enriched the Vatican with 1,900 precious manuscripts. The collection is known as the Ottobonian Library. Consult Cambridge, 'Modern History' (Vol. I); Hefele, 'History of the Councils'; Parsons, 'Studies in Church History'; Pastor, 'History of the Popes.'

ALEXANDER I, Emperor of Russia, son of Grand Duke Paul Petrovitch and Grand Duchess Maria Feodorovna, née Princess of Wurtemberg: b. 23 Dec. 1777; ascended the throne 24 March 1801; d. 1 Dec. 1825. Empress Catharine the Great took care of his education, which was conducted according to the best standard prevailing in Europe by a Swiss pedagogue, La Harpe, in co-operation with Professor Kraft and others. But La Harpe was soon dismissed because of his enlightened ideas of the age and his sympathy with the French revolutionists. Immediately upon the assassination of his father Paul I, of which crime it is alleged Alexander had a guilty knowledge, he ascended the throne and succeeded in restoring (15 June 1801) peace with Great Britain, and later (8 Oct. 1801) concluded conventions with France and Spain. During the reign of terror and insecurity of Paul I, Alexander conceived the idea of framing and giving to Russia a constitution with the national representation in the government, which was remarkable in a sovereign of his day and country, but which he, however, abandoned in the later years of his rule, adopting his predecessors' policy of repression and accepting the views of the notorious Prince Metternich. The following four years of his rule Alexander spent almost exclusively for the improvement of the internal affairs of which the most important are the two ukases, signed on 14 April 1801, whereby he diminished taxes, liberated

debtors, emancipated priests and deacons, abolished corporal punishments, paved the way for complete abolition of serfdom, etc. His co-operators in his reforms were the Anglophile Count Kotchubey, Prince Czartoryski, who was noted for his sympathy for the Poles, Count Strogonov, the great French admirer, and other able men of the empire. By his ukase of 8 Sept. 1802, he established definitely the duties and authorities of the senate and established the ministries of war, navy, foreign affairs, interior affairs, justice, finance, commerce and public education. In 1803 he established in Saint Petersburg the Academy of Science and in the following year the universities of Kazan and Kharkov. But the period of peace was soon to be disturbed. The incessant dissensions between France and Great Britain made it necessary for Russia to effect a rapprochement with England, Austria and Switzerland in the beginning of 1805 for the purpose of resisting the encroachments of France on the territories of independent states. The defeat of the Austrian army in the battle of Ulm forced Russia to send Austria help under the leadership of General Kutuzov. Alexander was personally at the head of the Russian army in the battle of Austerlitz (2 Dec. 1805), when the combined armies of Russia and Austria were defeated by Napoleon. Alexander was compelled to retreat to his dominions together with the remains of his routed army. Further results of that memorable battle were: the ever-growing hostility of Prussia toward Russia and the treaty of alliance, offensive and defensive, concluded 27 Dec. 1805, at Schoenbrunn, between Austria and Russia. In the succeeding campaign the Russians were again beaten at Eylau (8 Feb. 1807), and Friedland (14 June), the result of which was an interview a few days after the battle, on a raft anchored in the Niemen, between Alexander and Napoleon, which led to the treaty of peace signed at Tilsit. This treaty was confirmed by the convention of Erfurt (12 Oct. 1808) whereby Napoleon consented to the annexation of Wallachia and Moldavia to the Russian empire. The Russian Emperor now for a time identified himself with the Napoleonic schemes. The seizure of the Danish fleet by the British brought about a declaration of war by Russia against Great Britain and Sweden, and Alexander invaded Finland and conquered that long-coveted duchy. Alexander spent some time in Finland in order to establish personally good relations with the Finns, and to win their confidence; while in Saint Petersburg a separate Finnish committee was formed and a secretary of state for foreign affairs appointed. Less successful was the campaign carried on by Alexander against the Turks (1809–12) who now demanded the restoration to the Ottoman empire of the provinces of Wallachia and Moldavia. The war was ended by the Peace of Bucharest (1812). The French alliance, however, he found to be too oppressive, and his having separated himself from Napoleon led to the French invasion of 1812 in which the Russian armies were utterly defeated in the battle of Borodino. On 15 Sept. 1812, Napoleon made a triumphant entry into Moscow, which he found in flames. But seven days later, forced by famine, deprivation and by the lessening morale of his armies, Napoleon decided to leave Moscow, and his great retreat was converted into a rout by the brilliant victories of the Russian General Miloradovitch at Vyasma, of the Cossack hetman Platov at Vopa and of General Kutuzov at Krasnoe. The successful outcome of the campaign against Napoleon animated Alexander to further efforts to establish a permanent peace in Europe and, despite the advice of his pious friends, Chancellor Shishkov, General Kutuzov and Count Rumyantzev, who were unanimous against further wars, he was firmly resolved to cross the frontier (13 Jan. 1813) with his powerful army and to invade Prussia, and in August 1813 made an offensive and defensive alliance with that government. However, the Russian armies headed by General Withenstein, suffered, together with their Prussian allies, crushing defeats in the battles of Lützen and Bautzen (2 and 21 May respectively). The following year Austria joined hands with Russia and Prussia against Napoleon and, after numerous battles with alternative success, Paris fell into the hands of the Triple Alliance on 1 April 1814, and the campaign ended by the Treaty of Paris (1 June 1814). By the Treaty of Vienna, which was concluded 10 July 1815, Alexander secured for his empire a part of the duchy of Warsaw, the grand duchy of Poznan, and introduced into the part of Poland apportioned to Russia a liberal constitution. When the deposed Napoleon again landed in France, the Russian army moved rapidly from Poland to the banks of the Rhine and Alexander went from Vienna to Heidelberg. Napoleon's rule of the Hundred Days was ended, however, by his defeat at Waterloo and the French Bourbon dynasty was restored in the person of Louis XVIII. Alexander, moved by the desire of establishing a lasting peace in Europe, composed and signed, together with his Prussian and Austrian allies, a treaty of peace (26 Sept. 1815) known as the Holy Alliance (q.v.). The remaining part of his reign was chiefly taken up in measures of internal reform including the gradual abolition of serfdom and the promotion of education, religion, agriculture, commerce, navigation and manufactures.

Embittered and disappointed in liberalism and political altruism he turned even more toward religious fanaticism. The last years of his life Alexander spent either in traveling through the remotest parts of his empire or in complete seclusion in the Tsarskoe Selo. When in the year 1821 a Russian agent provocateur, Alexander Ipsilanti, started an insurrection in Greece against the Turks, Tsar Alexander formally protested and endeavored to reassure the Sublime Porte of the innocence of official Russia, but the Sultan would not believe in the sincerity of his action and a wholesale massacre of Christians in Constantinople took place, which forced the Russian ambassador, Baron Stroganov, to leave that capital in a hurry. The war, which for a time seemed imminent, was averted by Alexander's astute diplomacy only to break out shortly after his death. Alexander died at Taganroga where he had accompanied his consort, Empress Elizabeth Aleksyeevna, for the improvement of her health.

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W. N. PETROVITCH.

ALEXANDER II, Emperor of Russia, eldest son of Emperor Nicholas Pavlovitch and Grand Duchess Alexandra Theodorovna: b. 29 April 1818; d. Saint Petersburg, 13 March 1881. After having received a careful education, under the conduct of Professors Merder and Zhukovski, which covered especially natural sciences, statistics, law and modern languages (French, English, German and Polish), he applied his attention to practical military subjects. In order to acquaint himself with governmental machinery and affairs, Alexander, while still a youth of 17 years, was frequently present at the sessions of the Senate and the Holy Synod. His theoretical education was completed by extensive travels through Russia and Europe, of which he visited every country with the exception of France and Spain. On 16 April 1841 he wedded Princess of Darmstadt, who is known as Maria Alexandrovna, by whom he had eight children: Alexander, Nicholas, Vladimir, Aleksey, Marie, Serge and Paul. Alexander succeeded his father Nicholas I in 1855, before the Crimean War, which he conducted to a satisfactory close, considering the number of his enemies, on 31 March 1856, at the conference of Paris, by virtue of which the Black Sea was proclaimed neutral and Russia lost a part of Bessarabia. The new emperor immediately after the war set about effecting important reforms in the empire, among the first being the improvement of finances and state budget, judiciary system, city and country police and the system of popular education. The judiciary reform found expression in the publication of the «Judiciary ukases» in 1864 by virtue of which the judicial authority was severed from the executive, administrative and legislative powers, the positions of judges became life-permanent; court of cassation, juries and notaries public were also instituted. In the sphere of interior administration one of the most important is the reform combining city police with district police, in which latter a considerably larger power of administration was vested. But the greatest of all the reforms carried out by him was the emancipation of the serfs (about 23,000,000 people) by the ukase of 2 March 1861. This met with an unbounded enthusiasm of the people and was considered as a new epoch in the Russian history. His reforms in Russian Poland introduced by the imperial ukase of 26 March 1861 were also of a very liberal character, but they were not well received by the Poles, who, in 1863, protested against them by several armed insurrections. The rebellions were, however, speedily quelled and the rebels severely punished by the notorious Berg and Governor-General Muraviev. Tsar Alexander also effected important reforms in the military affairs of his empire. Thus in the very beginning of his rule he suppressed military settlements, reduced the length of service from 25 to 15 years, discontinued the humiliating corporal punishment and directed attention to the improvement of the education of the army officers, for which purpose a number of military academies were established. Although Alexander's rule might be considered comparatively a peaceful one, it was marked by several important wars. Soon after the Crimean War (1859) he had to quell the insurrection of the Caucasians, against whom he sent General Prince Baryatinski. The imperial armies, after having won several important battles (at Voden, etc.), surrounded the rebels and forced their chieftain, Shamil, to surrender in September 1859. Thus the eastern Caucasus was freed and occupied and the western fell into the hands of Alexander's armies five years later, when Grand Duke Michael Nikolayvitch was appointed governor of that region. In the course of that same year the Polish insurrection and the occupation of Turkestan took place. In the Far East, too, Alexander II effected important and advantageous changes without having recourse to arms. But the most important event of Alexander's rule is undoubtedly the Russo-Turkish War (1877–78), for it was by that successful campaign that Russia announced to the world her Panslavistic aims and her readiness to protect the smaller Slavonic nations against foreign rule. It came as a protestation on the part of the Russian people against the refusal of the Sublime Porte to introduce reforms in the Christian regions of European Turkey which had been promised by the Ottoman government and signed, in the form of a protocol by the six Great Powers in London, 25 March 1877. Simultaneously with the Russian declaration of war on Turkey the Serbians and Montenegrins and even the Rumanians made invasions of European Turkey for the purpose of freeing their Christian co-nationalists inhabiting Macedonia, the Sandjak of Novi Bazaar and Dobrudja, respectively. Russian armies, under the supreme command of Grand Duke Michael Nikolayvitch, joined by the Serbian and Montenegrin insurgents, utterly defeated the Turks; they were stopped only at the gates of Constantinople, not by the Turkish resistance but by British intervention and the Sultan's request for peace. The conditions of peace were agreed upon temporarily at the conference of San Stefano but were definitely settled by the Treaty of Berlin, 1878. By virtue of that treaty, which sensibly modified that of San Stefano, greatly to the disadvantage of Serbia, Bulgaria was recognized as a vassal, but fully autonomous principality, with the right of electing her own prince and maintaining her own army, while eastern Rumelia was placed under the suzerainty of the Sultan but with complete administrative autonomy. Serbia, Montenegro and Rumania were also proclaimed and recognized as independent states. With the

exception of the Delta in the Danube the whole of Bessarabia, lost to Russia in 1856, was now restored to Alexander's empire.

While the first years of Alexander's rule passed in a wholesome internal peace, the period following (from 1851) was greatly disturbed by the revolutionary element, in the empire, which exacted from the government a national-constitutional form of administration. This movement at first was conducted by the so-called "intelligentzia" (or educated classes) by means of circulars and pamphlets, but when the peasantry and craftsmen joined the college students it assumed rapidly terroristic pace and measures. Toward the end of Alexander's reign several attempts on his life were made by Nihilists, and at last he was assassinated by an explosive missile thrown at him in a street in Saint Petersburg. On the spot of his murder a magnificent church ("Voskressenie," i. e., "Resurrection") has been built, and many Russian cities have erected monuments to the memory of the "Tsar Liberator." The Bulgarians, too, have erected in front of their princely palace in Sofia a splendid monument to Alexander.

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ALEXANDER III, Emperor of Russia, second son of Emperor Alexander II and Empress Maria: b. 10 March 1845; ascended the throne 13 March 1866 at the age of 36; d. Livadia, 1 Nov. 1894. He married Princess Dagmar, the daughter of King Christian IX of Denmark, who changed her name, at the moment of adopting Orthodox faith, to Maria Feodorovna. Alexander's education was exceedingly careful and austere, which potentiated his innate love for stern order and strict adherence to everything Russian even to the purity of the Russian language. He was more in favor of French civilization than the German culture and became a powerful Slavophile. At the time of the Russo-Turkish War (1877–78) he had a brilliant opportunity to put in practice his military education, for he participated in that campaign as the commander of the Rustchuk division, in which capacity he rendered splendid services by his shrewd tactics. After his father's violent death, he secluded himself for some time in his palace at Gatchina. For that same reason his coronation was postponed till 1883 and was celebrated with an extraordinary magnificence and with great national festivities. Through the fall of Merv, the subjugation of the Turkomans in central Asia was completed. In 1885 hostilities with Great Britain with regard to the defining of the frontier between the Russian territories and Afghanistan for a time seemed imminent, but Alexander succeeded in annexing to his empire a considerable stretch of land on which a railway was constructed, uniting the centre of the Russian possession in central Asia with the Caspian Sea. In European affairs he broke away from the Triple Alliance between Russia, Germany and Austria and directed his attention to France whose friendship he wished to cultivate. He was aggrieved by the new Bulgarian spirit of ingratitude for the liberation of their country by his father Alexander II; but he finally crushed Stambulov and his band. With regard to home affairs Alexander III announced at the very time of his accession to the throne that he had no intention of limiting or reducing the autocratic power exercised by his predecessors; on the contrary he suppressed even the liberties which were granted by his father and his grandfather and he maintained that Nihilism and Anarchism in Russia could not be changed by democratic and parliamentary institutions but by austere principles of Orthodoxy, nationalism and, if need be, autocracy. As he believed in uniformity of customs, language and religion throughout his vast empire he imposed, sometimes in a cruel manner, the Russian language on his Polish, Finnish and German subjects and caused many bloody persecutions of the Jews. If one could not call him an absolute autocrat, one is safe in characterizing his rule as an iron imperialism, for he sought, more than any of his predecessors, for centralization of imperial administration which he strove to place almost wholly under his control. He made strong efforts to prevent malversation by officials, hitherto corruptible to an incredible degree, and stern economies were practised. The liberties granted by his ancestors to the Baltic provinces and Finland were also curtailed. Despite the most rigid police surveillance several Nihilist attempts were made on his life. That unfortunate Tsar was forced, throughout his reign, to keep himself practically a prisoner in his palace. Consult Andrews, 'Historical Development of Modern Europe' (Vol. II, New York 1898); Flourens, E., 'Alexandre III, sa vie, son œuvre' (Paris 1894); Lothrop, A. S., 'The Court of Alexander III' (Philadelphia 1910); Lowe, C., 'Alexander III of Russia' (New York 1895); Samson-Himmelstierna, 'Russland unter Alexander III mit Rückblicken auf die jüngste Vergangenheit' (Leipzig 1891); Seignobos, 'Political History of Modern Europe' (New York 1900).

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ALEXANDER I, King of Scotland, fourth son of Malcolm Canmore; b. about 1078, in 1107 succeeded his brother, Edgar, only, however, to that part of the kingdom north of the firths of Forth and Clyde; d. Stirling 1224. He married Sibylla, a natural daughter of Henry I of England, and his reign was comparatively untroubled, though about 1115 he had to quell an insurrection of the northern clans. He founded the abbeys of Scone and Inchcolm and initiated a diocesan episcopate; while his determined resistance to the claims of York and Canterbury to supremacy over the see of Saint Andrews did much to secure the independence, not only of the Scottish Church, but of Scotland itself.

ALEXANDER II, King of Scotland: b. Haddington 1198; d. 1249. He succeeded his father, William the Lion, in 1214. He early displayed that wisdom and strength of character

in virtue of which he holds so high a place in history among Scottish kings. His entering into a league with the English barons against King John drew down upon him and his kingdom the papal excommunication; but two years later the ban was removed and the liberties of the Scottish Church were even confirmed. On Henry III's accession to the English throne Alexander brought the feuds of the two nations to a temporary close by a treaty of peace (1217), in accordance with which he married Henry's eldest sister, the Princess Joan (1221). The alliance thus established was broken after her death without issue (1238) and the second marriage of Alexander with the daughter of a noble of France. In 1244 Henry marched against Scotland to compel Alexander's homage, but a peace was concluded without an appeal to arms. In 1249, while engaged in an expedition to wrest the Hebrides from Norway, Alexander died of fever on Kerrera, near Oban.

ALEXANDER III, King of Scotland: b. 1241; succeeded his father, Alexander II, 1249; d. 12 March 1286. In 1251 he married the Princess Margaret (1240–75), eldest daughter of Henry III of England. Very shortly after he had come of age his energies were summoned to defend his kingdom against the formidable invasion of Haco, King of Norway (1263), whose utter rout at Largs secured to Alexander the allegiance both of the Hebrides and the Isle of Man. The alliance between Scotland and Norway was strengthened in 1282 by King Eric's marriage to Alexander's only daughter, Margaret (1261–83); the untimely death of their infant daughter, Margaret, commonly designated the Maid of Norway, on her way to take possession of her throne, was the occasion of many calamities to Scotland. During the concluding years of Alexander's reign the kingdom enjoyed a peace and prosperity which it did not taste again for many generations. His only surviving son died without issue in 1284; and next year Alexander contracted a second marriage with Joleta, daughter of the Comte de Dreux.

ALEXANDER I (Obrenovitch), King of Serbia, second son of King Milan and Queen Nathalie: b. 14 Aug. 1876; d. 10 June 1903. He received his education chiefly in Serbia where he mingled with a band of young officers of no very high culture. Even from his early boyhood those officers poisoned Alexander's mind with distrust in the political friends who surrounded him after the abdication of his father in 1889. From that time to 1893, as Alexander was under age, the executive power of the state was vested in a regency of three statesmen. But in April of that year Alexander, then only in his 17th year, by a cleverly prearranged *coup d'état,* proclaimed himself of age, ousted the regents, dismissed their government and took the executive power into his own hands. His act met with unbounded approval from the leaders of the then mighty Radical party and Alexander forthwith appointed a Radical ministry presided over by Mr. Pashitch. The Radicals, in their turn, were estranged when their king, by another *coup d'état,* abolished the liberal constitution granted by his father in 1889 and restored that of 1869 which was not only conservative but even somewhat autocratic in character. During the summer of 1900, when King Milan was in Austria endeavoring to secure for his son the hand of a German princess, Alexander, to the amazement of all his friends, married his former mistress, Mme. Draga Mashin, the widow of a civil engineer and former lady-in-waiting to Queen Nathalie. Even Milan refused to condone this action, for Mme. Mashin was a woman much older than Alexander and of so impossible a reputation that the possibility, had it existed, of her bearing an heir to the throne could not but be revolting to the Serbian people. Under Draga's influence Alexander initiated a rule of almost Neronian tyranny. The Radical party was terrorized by one *coup d'état* after another; the vulgar Queen offered incessant insults to the highest dignitaries of the state and court officers, she roused the whole country to a white heat of excitement by a simulated accouchement, and when the myth was exploded and the friendship of the Russian Tsar lost, she began to intrigue to secure the succession for her own brother, Lieutenant Nikodiye, a man as objectionable and arrogant as the Queen herself. Thus blunders and outrages followed each other under the most impossible couple that ever occupied a throne. King Alexander, in order to veil his ill deeds before the eyes of the people, granted a comparatively liberal constitution (April 1901) only to suspend it by another *coup d'état* (March 1903). This aroused the indignation not only of the members of the National Assembly (Skupshtina) and the Senate, but also, and especially, of the army officers. The end of Alexander and Draga came, however, on the night of 10 June 1903; a group of malcontent officers entered the palace and murdered the King. On this occasion Draga was also mortally wounded as revolver shots were exchanged in the complete darkness which reigned in the palace on account of the electric wires having been cut by the friends of the King. Draga's brother, the prime minister, the minister of war and Alexander's aide-de-camp were also assassinated. The next day the army proclaimed Prince Peter Karageorgevitch, son of Alexander Karageorgevitch and grandson of Kara-George Petrovitch, King of Serbia, which election was confirmed five days later by the National Assembly.

ALEXANDER I, Prince of Bulgaria, né Prince of Battenberg: b. 17 April 1857; d. 26 Nov. 1893. He received his military education in the cadet-corps in Dresden and was appointed second lieutenant in the 24th dragoon regiment. Later he served with the Russian Uhlans, in whose ranks he fought against the Turks in the Russo-Turkish War of 1877–78. On 10 May 1879, thanks to his influence in Germany, Austria and even of his Russian friends, he was elected by the Bulgarian Sobranje of Trnovo, hereditary Prince of Bulgaria, immediately after which event he visited the most important courts of Europe and, on 17 July 1879, he was presented to his suzerain, Sultan Abdul-Hamid II, from whom he obtained the imperial firman granting him the principality of Bulgaria. Soon after his ascension to the throne he initiated an anti-Russian policy, ignoring the deeds of Emperor Alexander II, called by the Bulgarians the "Tsar Liberator," which, naturally, alienated Russian friendship for Bulgaria. In 1885 King Milan

of Serbia declared war on Bulgaria in order to prevent the annexation of East Rumelia to that principality, which ended by the Treaty of Bucharest 1886 but which, although favorable for Bulgaria, did not in any measure improve Alexander's impossible position. However, the unfriendly attitude of Alexander toward Russia caused in Bulgaria a popular movement and on 3 Sept. 1886 his palace in Sofia was attacked and he was kidnapped and taken to the Russian town Reni. Afterward he was released and taken back to Sofia through the indignation of his powerful party. Having lost Russian protectorate he found it absolutely indispensable to abdicate (7 Sept. 1886) and to leave Bulgaria and to join the Austrian army in the capacity of a colonel of the dragoons. He was buried in the church of St. George at Sofia. Consult Koch, A. (Alexander's chaplain), 'Mitteilungen aus dem Leben und der Regierung des Fürsten Alexander von Bulgarien' (Darmstadt 1887; Draudor, Prince Alexander of Battenberg (1884) Macdonald, 'Czar Ferdinand and His People' (New York 1913); Sobolef, 'Der erste Fürst von Bulgarien' (Leipzig 1886).

ALEXANDER, Abraham, American agitator: b. North Carolina 1718; d. 1786. His place in history is due to the fact that he was chairman of the convention which on 31 May 1775 passed the resolutions generally known as the «Mecklenburg Declaration of Independence» (q.v.).

ALEXANDER, Archibald, American clergyman: b. Virginia, 17 April 1772; d. Princeton, N. J., 22 Oct. 1851. He studied theology and performed itinerant missionary work in various parts of Virginia; became president of Hampton-Sidney College in 1796 and pastor of a Presbyterian church in Philadelphia in 1807. On the establishment of Princeton Theological Seminary in 1812 he was appointed its first professor, a position which he held till his death. Among other works he published: 'Outlines of the Evidences of Christianity,' 'Treatise on the Canon of the Scriptures' (1826); 'History of the Patriarchs' (1833); and 'History of the Israelitish Nation' (1852); his 'Moral Science' was posthumous.

ALEXANDER, Barton Stone, American soldier: b. Kentucky 1819; d. San Francisco, Cal., 15 Dec. 1878. He was graduated from West Point 1842 and became lieutenant in the engineer corps; as such he superintended the building of Minot's Ledge lighthouse off Boston Harbor, the marine hospital at Chelsea, north of Boston, and the military asylum at Washington, besides repairs on fortifications. He assisted in constructing the defenses of Washington in the Civil War, took part in the first campaign about Manassas and was brevetted major for conduct at Bull Run; and remaining with the Army of the Potomac was brevetted lieutenant-colonel for conduct at the siege of Yorktown in 1862. In 1864 he was consulting engineer on Sheridan's staff and in March 1865 was brevetted brigadier-general for services in the war. The next two years he was in charge of the construction of the public works in Maine and in 1867 became senior engineer with rank of lieutenant-colonel. Thence till death he was a member of the Pacific board of engineers for fortification.

ALEXANDER, Cecil Frances (HUMPHREY), Irish poet: b. County Wicklow 1818; d. 12 Oct. 1895. She was very active in religious and charitable works. She is best known as a writer of hymns and religious poems. Among the most noted are the hymns 'The Roseate Hue of Early Dawn' and 'All Things Bright and Beautiful.' Her most famous poem is 'The Burial of Moses.'

ALEXANDER, Edward Porter, American military engineer: b. Washington, Ga., 26 May 1835; d. Savannah, Ga., 28 April 1910. Graduating from West Point 1857, he was made second lieutenant in the engineer corps; resigned 1861 and entering the Confederate army served there till the surrender at Appomattox, April 1865, at first as chief of ordnance and chief signal officer in the army of Northern Virginia, then as brigadier-general and chief of artillery in Longstreet's corps, taking part in the Wilderness and Spottsylvania and the siege of Petersburg. From 1866 to 1870 he was professor of mathematics and engineering in the University of South Carolina; thence (1871–92) manager and president of some of the foremost Southern railroads. He was a government director of the Union Pacific Railroad (1885–87), a member of the boards on navigation of the Columbia River and on the Chesapeake-Delaware Ship Canal (1892–94) and in 1891 engineer arbitrator of the boundary survey between Nicaragua and Costa Rica.

ALEXANDER, James, American colonial lawyer and patriot: b. Scotland about 1690; d. New York, 2 April 1756. He was an engineer officer in Scotland; compelled to leave Great Britain for taking part in the Old Pretender's Rebellion of 1715, he came to Perth Amboy, was its first official recorder in 1718 and was shortly after appointed surveyor-general of New York and New Jersey. Studying law, he rose to distinction at the bar. He engaged in political debate in the press; was temporarily disbarred for serving as counsel to a printer accused of sedition, but was reinstated two years later; held many important public offices, including those of attorney-general and of secretary to the province of New York; acquired a large fortune and was a zealous upholder of colonial liberties. He died from the fatigues of a journey from New York to Albany undertaken to oppose a ministerial project threatening colonial rights. With Franklin and others he founded the American Philosophical Society. His son was the famous «Lord Stirling» of the Revolution.

ALEXANDER, James Waddell, American clergyman, son of Archibald Alexander: b. near Gordonsville, Va., 13 July 1804; d. 31 July 1859. He studied in Philadelphia, then was graduated at Princeton and from its theological seminary. He held a pastorate at Charlotte Court House, Va. (1825–28) and the First Presbyterian Church in Trenton, N. J. (1828–30). Resigning from ill health, he became editor of the Philadelphia *Presbyterian.* He was professor of rhetoric and *belles-lettres* in Princeton (1833–44); pastor of the Duane Street Church, New York (1844–49); professor of ecclesiastical history and church government

in Princeton Seminary (1849–51); from 1851 till death pastor of his old Duane Street Church, reorganized as the Fifth Avenue. He wrote much for religious and other periodicals and for the Tract Society, and over 30 volumes for the American Sunday-School Union. He published also volumes of sermons: 'The American Mechanic and Workingman' (2 vols., 1847); 'Plain Words to a Young Communicant' (1854); a biography of his father (1854); 'Discourses on Christian Faith and Practice' (1858); 'Thoughts on Preaching' (1864); etc.

ALEXANDER, John Henry, American scientist: b. Annapolis, Md., 26 June 1812; d. 2 March 1867. Graduating from St. John's College, Annapolis, 1826, he studied law, then engineering; and a plan for the survey of Maryland he put before its legislature gained him the appointment of topographical engineer of the State, which he held till 1841, preparing annual reports which did much to enlist capital in developing its coal and iron fields. He published a two-part 'History of the Metallurgy of Iron' (1840–42). He was also associated in Hassler and Bache's coast survey. He made great efforts to establish a uniform standard of weights and measures in the United States, and published in 1850 a 'Universal Dictionary of Weights and Measures, Ancient and Modern.' In 1857 the United States government sent him to England as a delegate to the British commission on international coinage and his appointment to the directorship of the Philadelphia mint was only prevented by his death. He served on many commissions and published very valuable reports, papers in the *American Journal of Science and Arts,* etc. He was also at different times professor of physics in St. James' College, Maryland, the University of Maryland and the University of Pennsylvania. He also wrote volumes of religious verse, an unpublished 'Dictionary of English Surnames,' etc., and edited scientific works.

ALEXANDER, John White, American artist: b. Allegheny City, Pa., 7 Oct. 1856. For three years he was connected with the art department of the Harpers and then was three years abroad, studying at the National Academy of Fine Arts, Munich, and with Duveneck in Venice and Florence. Upon his return to the United States he was active as a magazine illustrator. Attention was first attracted to his paintings by his exhibit in the salon of the Champ de Mars in 1893. He received the gold medal of the Philadelphia Academy of Fine Arts in 1897, and gold medals at the Paris Exposition of 1900 and the Pan-American Exposition, Buffalo, in 1901. In 1902 he was elected an academician of the National Academy. He is represented in the Luxembourg and many American and European collections; and by six lunettes depicting 'The History of the Book' in the east hall of the Congressional Library, Washington.

ALEXANDER, Joseph Addison, American Biblical scholar, son of Archibald Alexander: b. Philadelphia, Pa., 24 April 1809; d. 28 Jan. 1860. He was graduated first in the Princeton class of 1826 and with R. B. Patton founded Edgehill Seminary there. He was adjunct professor of ancient languages at Princeton, 1830–33, then spent some years abroad in linguistic studies; from 1838 till death was professor at Princeton Seminary, 1838–50 of Oriental and Biblical literature, 1851–60 of church history and government, 1859–60 of New Testament history and Biblical Greek. He was ranked among the foremost of American bibliologists, an Orientalist of high order and a linguist of eminent variety and soundness. His exegetical works include commentaries on Isaiah (1846, 1847, 1851), the Psalms (3 vols., 1850), Acts (1857), Mark (1858), all indebted to German sources. His sermons were collected in two volumes, 1860.

ALEXANDER, Mrs., pseudonym of Annie Hector (q.v.).

ALEXANDER NEVSKY, nyĕf'skē, **Saint,** Russian hero: b. Vladimir 1220; d. 1263. Of noble birth and lord paramount of the Russian nobility, he is renowned for his victory in 1240 over the Swedes, Danes and Knights of the Teutonic order, on the Neva, where Petrograd now stands, when Russia was still suffering from the terrible effects of the Tartar invasion. For this victory he received his surname of "Nevsky." In 1238 Russia had become vassal to the Tartars. By submission to the conquerors, Alexander used his best endeavors to prevent a recurrence of the invasion while the country was recuperating and died when on a third return journey from the Tartar capital, where he had succeeded in winning substantial concessions. His exploits are preserved in national songs, the Russian Church canonized him and Peter the Great in 1723 built a magnificent monastery to his memory on the spot where the battle of the Neva was won, transferred his remains there from Vladimir in 1724 and created the order of Knights of St. Alexander Nevski in 1725.

ALEXANDER OF APH'RODIS'IAS, Greek philosopher, surnamed "the Expositor": lived about 200 A.D. As head of the Lyceum at Athens, he became a distinguished exponent of the doctrines of Aristotle and author of commentaries on his works, which, translated into Latin, were adopted by the "Alexandrist" philosophic school of the Renaissance and are still useful in the interpretation of Aristotle. His own original works include 'On the Soul' and 'On Fate.' The latter, in which he controverts the doctrine of necessity, was published by Orelli at Zurich in 1824.

ALEXANDER OF HALES, English philosopher and theologian: b. Hales, Gloucestershire; d. Paris 1245. One of the greatest of the schoolmen, he was among the first to study Aristotle from the point of view of the Arabic commentators. His chief work was 'The Sum of Theology' (1475).

ALEXANDER OF RUMANIA, Hospodar of Rumania: b. Husch, 20 March 1820; d. Heidelberg, 15 May 1873. On 29 Jan. 1859 he was chosen hospodar at Jassy and on 17 February at Bucharest, with title Alexander John I. By abolishing serfdom and dividing landed properties he benefited the peasantry, but his efforts toward centralization caused discontent and on 22 Feb. 1866 he was compelled to abdicate.

ALEXANDER, Samuel, English educator and philosopher: b. Sydney, N. S. W., 6 Jan. 1859. He was educated at the University of

Melbourne and at Balliol College, Oxford. From 1882 to 1893 he was fellow of Lincoln College. He is professor of philosophy at the Victoria University of Manchester since 1893. He was chosen fellow of the British Academy in 1913, was president of the Aristotelian Society 1908–11 and in 1915 was appointed Gifford Lecturer for 1916–18 at the University of Glasgow. He has published 'Moral Order and Progress' (1889); 'Locke' (1908) and various papers on philosophical subjects in *Mind*, the *British Journal of Psychology*, the *Proceedings of the Aristotelian Society* and other journals.

ALEXANDER SEVE'RUS, Roman emperor (in full, MARCUS AURELIUS ALEXANDER SEVERUS): b. Ace (the modern Acre), Phœnicia, 205 A.D.; d. 235. He was the son of Genesius Marcianus and of Julia Mammæa, niece to the Emperor Severus. He was admirably educated by his mother, and was adopted and made Cæsar by his cousin Heliogabalus, then but a few years older than himself, at the prudent instigation of their common grandmother, Mæsa. That contemptible Emperor, however, soon grew jealous of his cousin and would have destroyed him but for the interference of the prætorian guards, who soon after put Heliogabalus himself to death and raised Alexander to the imperial dignity in his 17th year, 11 March 222. Alexander adopted the noble model of Trajan and the Antonines, and the mode in which he administered the affairs of the empire, and otherwise occupied himself in poetry, philosophy and literature is eloquently described by Gibbon. On the whole, he governed ably both in peace and war; but whatever he might owe to the good education given him by his mother, he allowed her a degree of influence in the government which threw a cloud over the latter part of his reign. He however finally became convinced that in this matter he had allowed his filial reverence to mislead him and is said to have reproached his mother with his dying breath as the cause of the disaster which had befallen them both. Alexander behaved with great magnanimity in one of the frequent insurrections of the prætorian guards; but, either from fear or necessity, he allowed many of their seditious mutinies to pass unpunished, though in one of them they murdered their prefect, the learned lawyer Ulpian, and in another compelled Dion Cassius, the historian, then consul, to retire to Bithynia. At length, after having defeated, in 232, the Persians under Artaxerxes, who wished to drive the Romans from Asia, and undertaking an expedition into Gaul to repress an incursion of the Germans, he was murdered with his mother in an insurrection of his Gallic troops, headed by the brutal and gigantic Thracian, Maximin, who took advantage of their discontent at the Emperor's attempts to restore discipline. Alexander was favorable to Christianity, following the predilections of his mother, Julia Mammæa, and he is said to have placed the statue of Jesus Christ in his private temple with those of Orpheus and Apollonius of Tyana.

ALEXANDER THE GREAT, the 3d King of Macedon bearing the name which he made so famous: b. Pella 356 B.C.; d. Babylon 323 B.C. His mother was Olympias, an Epirote princess, who traced her descent from Achilles. There is little reason to doubt that his father was Philip of Macedon, though the latter was not confident about his paternity and though there is no evidence of any feelings between the two such as are expected to exist between father and son. On the contrary, Philip seems to have resented the imperial qualities of his son, which he was clever enough to see and appreciate; and Alexander showed a precocious envy of his father's neglected opportunities of conquest, a feeling which the sagacious biographer Plutarch has noted and welt on. No open rupture took place till Philip repudiated Olympias to wed a Macedonian lady (Cleopatra according to Plutarch and others, but Eurydice according to Arrian). During the nuptial feasting Philip made at Alexander with his sword, while the son jeered at his father's drunken fury and unsteady gait. In the assassination of Philip in 336 the repudiated and banished Olympias certainly had a hand, and we cannot be sure that Alexander was not an accomplice.

The memorable year in which Alexander first appeared on the stage of universal history was 339 B.C. At the age of 16 the regency of Greece was entrusted to him by Philip when he set out on an expedition against Byzantium; and in that capacity it fell to his lot to lead his first army against an Illyrian rising, to found his first Alexandria in the upper valley of the Strymon and to receive a deputation of envoys from the King of Persia,—a fit beginning for the miracle of precocity who was afterward to destroy Thebes at 21, to conquer Babylon at 25 and to die master of the world at 33. In the year after his appointment to the regency Alexander showed eminent military capacity at the battle of Chæronea (338) and, on the murder of Philip, ascended the throne in 336, before he had reached his 20th year.

The brilliant natural gifts of Alexander had been developed under the tutelage of Aristotle. His personal beauty, with its ardent expressiveness and flashing eyes, was very remarkable, and he was pre-eminent in horsemanship and all athletic accomplishments. A habit (or perhaps some peculiar muscular conformation of the neck) which gave his head a tilt toward the left shoulder imparted to him an air of hauteur, which gave a note of eminent distinction to manners of charming grace and affability. He was of an extremely trusting disposition. His position in ascending the throne was a difficult one. He had enemies on every side. The Illyrians and Thracians were always watching an opportunity to attack Macedon, and indeed most of the Grecian states were ready, if possible, to throw off the Macedonian yoke. Persia regarded the growth of Macedon with suspicion, and finally his own Macedonian subjects were far from being united in approval of the career of conquest on which Philip and Alexander had both resolved to embark.

His reign began with an act of cruelty such as was destined subsequently to become almost a matter of course on every change of rulers; his uncle and his half-brother were put to death and the little daughter of Cleopatra, Philip's widow, was butchered in the arms of her mother. In the autumn of 336 Alexander marched into Greece and was confirmed in the chief command against Persia by the Amphictyones at Thermopylæ. In 335 he advanced to

the Hæmus range (the Balkans) and showed great ability in his campaign against the Thracians, crossing the Danube — apparently out of mere bravado — in the face of the enemy without losing a single man. He had no real friends among the Greek states. The Thebans, hearing a false report of his death, became overt enemies, proclaimed their independence and slew some Macedonian officers. Alexander appeared in Bœotia with amazing dispatch and took Thebes by storm on the third day of the siege. This was the occasion on which, in the words of Milton,

> "The great Emathian conqueror bade spare
> The house of Pindar."

Leaving Antipater to govern in Europe, he crossed over into Asia in the spring of 334 with 30,000 foot and 5,000 horse. The Persian empire, the conquest of which he undertook, was at least 50 times as large as his own and numbered about 20 times as many inhabitants. It extended from the Hellespont to the Punjab, from Lake Aral to the cataracts of the Nile. But it was a vast congeries of subject provinces having no internal bond and no principle of cohesion but the will of the king. For 80 years it had been tending to dissolution in its western provinces, which were the most exposed to danger. As stages in this process may be mentioned the revolt of Egypt under Amyrtæus in 410 and that of the Cypriote Evagoras, which was not put down till 383; the numerous revolts of satraps, of Greek cities and of semi-Greek tyrants during the first half of the 5th century and the attack on Persia made by Tachos, King of Egypt, in 361. It has been well remarked by Adolf Holm that the position of the Persian empire when attacked by Alexander had some resemblance to that of the Roman empire when overrun by the Germans. Both empires held together merely by the law of inertia; in both their strength lay not in their native elements, but in mercenaries taken from the very peoples, the Germans and the Greeks, who threatened respectively the safety of the two empires. Alexander proposed to himself nothing short of complete dispossession of Darius in favor of himself as captain-general of Hellas and the establishment of his own Panhellenic empire in the room of the Persian. He was not led from point to point by this or that strategical reason. His business was not to leave Asia till every satrapy in the Persian empire acknowledged his sway. Even the burning of the Persian capital Persepolis was probably no act of drunken folly, as which it has often been described, but rather a signal and emphatic assertion of mastery and ownership, as of one who should say, "The Persian empire is mine, to throw it into the fire if I please." Alexander had no intention of remaining King of Macedon. His design was to be the Greek emperor of Europe and Asia, and this position in effect he assumed on the death of Darius. With this view throughout his whole career in Asia he sought as much as possible to fuse and commingle his Asiatic and European subjects, very much as England did in India. This was the project to which he was giving all his efforts at the time of his death.

The first hostile army he encountered was on the Granicus River (an affluent of the Sea of Marmora). He crossed the Granicus, just as he afterward crossed the Pinarus at Issus, in full view of the enemy, hurled himself with all his force on their centre and completely broke it up. It was not his way to refrain from the pass in *quart* till he had first hit in *tierce*. His victories sometimes remind us of the oft-quoted *C'est magnifique, mais ce n'est pas la guerre*. He won by an impetuous dash a victory which a subtler strategy might have failed to achieve, just as his sword-cut at Gordium made away with the knot which his fingers could not undo. The victory at Granicus was attended with unprecedented results; Sardis, Miletus, Ephesus, Halicarnassus submitted one after another, and he established in them democracies of the Greek type. In November 333, Darius, eager to meet the invader, hastened to the sea-coast near Issus (at the head of the Gulf of Iskanderoon). The tactics pursued at the Granicus had here again a successful issue. Darius fled, leaving his family and his treasures in the hands of the conqueror. The mother, wife, two daughters, and son of Darius were treated with a clemency which foreshadowed the ages of chivalry. An Asiatic conqueror would have put the males to death, probably with torture, and would have sent the females to his harem. Captive Greek generals he also spared and liberated. He took possession of Damascus, a city which even then could boast of a hoary antiquity, and secured all the towns along the Mediterranean Sea. His plan now was to occupy Egypt, and this was made easy by the capture of Tyre on 20 Aug. 332, after a siege of seven months. During the siege a message came from Darius offering Alexander 10,000 talents, the hand of his daughter in marriage, and Asia as far as the Euphrates, if he would make peace. "I would accept it if I were Alexander," said his general, Parmenio. "So would I," replied Alexander, "if I were Parmenio." Gaza fell in November 332, and Alexander, taking possession of Egypt, sacrificed to Apis and the Egyptian gods in Memphis and held musical and athletic competitions after the Greek fashion in Tyre. Thus he conciliated the affections of his subjects. Politically he organized Egypt as a province in a way which, as Arrian remarks, foreshadowed the Roman system, giving the civil administration first to two, and then to a single governor, while the troops were placed under several separate commanders. It was now that Alexander founded the celebrated Alexandria — destined in two generations to be the first city in the Levant — and marched through the Libyan desert to consult the oracle of Jupiter Ammon, whose son he claimed to be.

Meantime Darius was collecting an army in Assyria; but before the decisive battle of Arbela he made overtures of peace to Alexander, whose answer was, "I, Alexander, hold all thy treasure and all thy land to be mine," — a verbal cutting of the Gordian knot. The Persian force encountered by the Greeks at Gaugamela, near the ancient Nineveh, and about 50 miles from Arbela (which strangely has given its name to the battle ever since), is said to have numbered 1,000,000 infantry, 40,000 cavalry, 200 scythed chariots and 15 elephants. Alexander had only 40,000 foot and 7,000 horse, but he won a decisive victory on 1 Oct. 331. The Macedonians aimed at the faces of their adversaries, as the Cæsarians afterward did at

Pharsalus. Babylon and Susa opened their gates to the conqueror, who then entered Persepolis, the capital of the province of Persis, seized its immense treasures and burned its palace and citadel to the ground.

In the spring of 330, Alexander proceeded to Media in pursuit of Darius. That weak monarch was being carried about by Bessus, satrap of Bactria, who, on hearing of the approach of Alexander, inflicted a mortal wound on Darius and fled, leaving him to die. Darius died before Alexander came up with him (July 330). The conqueror sent his body to Persepolis to be interred with royal honors. After taking possession of Hyrcania and Bactriana he was meditating still more gigantic plans, when he learned in the autumn of 330 that Philotas, the son of Parmenio, though cognizant of a conspiracy against his life, had not reported it. He put both Philotas and Parmenio to death. The execution of the former has been condemned, but is on the whole defensible; the murder of the latter is an inexcusable act of brutal tyranny. About the end of 330 or the beginning of 329 he crossed the great range of the Caucasus (not the modern Caucasus, but the Hindu Kush), by a pass at an altitude of 13,200 feet — a march comparable with that of Hannibal over the Alps. He reached the city of Bactra (Balkh), and made his way north as far as the Jaxartes or Tanais, where he founded a city, probably the modern Khojend.

He remained in these regions till the summer of 327, spending the winter in Nautaca, on the right bank of the Oxus. Here occurred the murder of Clitus, and Alexander's marriage with Roxana, daughter of Oxyartes, a satrap of Sogdiana. She had a son named after his father in 323. After the death of Alexander she compassed the destruction of his other wife, the daughter of Darius, and was killed with her son in 311 by Cassander. The murder of Clitus has been regarded as a great blot on the career of Alexander. But the circumstances in which he was placed greatly extenuate the act. The East believed in the divinity of Alexander, and such a belief was almost an essential condition of the permanence of his empire. When one of his own officers openly denied and ridiculed the Emperor's pretensions at a state banquet he seriously imperiled the Hellenic *raj*. The empire of Alexander was never subject to a second single emperor. The destinies of the West awaited the struggle between Rome and Carthage. But his vast empire nowhere save in India reverted to the pre-Alexandrine type.

Alexander now formed the idea of conquering India. He passed the Indus in 327, and formed an alliance with Taxiles, under whose guidance he reached the Hydaspes (modern Jhelum). This river he crossed after a severe struggle with Porus, in whom he met an opponent very superior to the Persian satraps who had hitherto confronted him or rather retreated before him. He then moved farther east and crossed the Acesines (Chenab) and the Hyraotes (Ravi), and reached the Hyphasis (Beas), which now joins the last river of the Punjab, the Sutlej, but which then flowed in a different channel. He never reached the Sutlej itself. The murmurs of his army compelled him to return. The fine instrument which he had fashioned so dexterously broke in his hand. He recrossed the Acesines to the Hydaspes, where he completed the cities of Nicæa and Bucephala (named after his famous horse Bucephalus), which he had already begun. He had only seen the fringe of India — the Punjab. The wondrous country of Brahma and Buddha never felt the sway of Alexander. He was obliged to content himself with writing his name large across the histories of Hellenic, Semitic, Egyptian and Iranian civilization. Alexander's name does not appear in Sanskrit literature.

When he had reached the Hydaspes he built a fleet, in which he sent part of his army down the river, while the rest proceeded along the banks. The city of the Malli, where Alexander was wounded, is probably Multan; Puttala is perhaps Haidarabad. The march of 500 miles through the hideous desert of Gedrosia (Baluchistan), and the voyage of Nearchus, have given much material to romancers and rhetoricians. At Carmania he was joined by Craterus, who had marched through the Bolan Pass to Kandahar, and by Nearchus, whose voyage, then thought so marvelous a feat, is no more than the short steam run from Karachi to Bunder Abbas. From Carmania he went to Pasargadæ, and thence to Susa, where he devoted himself with great energy to the task of uniting as far as possible the Macedonian and Persian nations. Alexander married two Persian princesses, and he gave rewards to those of his staff who followed his example in contracting Persian alliances. He sent home to Macedonia, with a present of a talent each, about 10,000 Macedonians who by age or wounds were incapacitated for service. These veterans were led by Craterus, who was sent to succeed Antipater as governor of Europe. Antipater seems to have fallen into disfavor, though in 330 he had done service in defeating Agis, the Spartan king who threatened Megalopolis. It was of this exploit that Alexander contemptuously observed, «So there has been a battle of the mice in Arcadia, while we have been conquering Asia.»

In 323 Alexander arrived at Babylon, where he found numberless envoys from nations near and far, come to pay their homage to the young conqueror. He was engaged in very extensive plans for the future, including the conquest of Arabia and the reorganization of the army, when he fell ill of a fever, shortly after the death of his beloved Hephæstion, which had deeply affected him. He died in 323, after a reign of 12 years and 8 months. The day before a rumor had gone abroad that the great general was dead, and that his friends were concealing the truth. The dying King caused his army to defile past his bed, and feebly waved them a last farewell. Alexander was a great administrator, a second Pericles in his devotion to work, an Alcibiades in his distinguished presence, a Phocion in his simplicity of character. He possessed eminent qualities as a statesman as well as a military leader. It is unfortunate that he did not live to carry out his plans for trade development. The Romans enjoyed the fruit of his victories, and his conquests made possible the spread of Christianity in the East.

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tory of Greece' (New York 1853–56); Holm, 'Griechische Geschichte' (Vol. III, Berlin 1893); Mahaffy, J. P., 'Story of Alexander's Empire' (1886); id., 'Progress of Hellenism in Alexander's Empire' (1905); Wheeler, B. I., 'Life of Alexander the Great' (New York 1900).

ALEXANDER, Sir **William,** Earl of Stirling, poet and statesman: b. 1567; d. London 1640. Tutor to Prince Henry, son of James I; knighted 1609; held various high offices under the Crown and in 1621 received the famous and stupendous grant of land embracing what is now Canada and the best portion of the New England States, and given almost absolute authority in its government, a grant that roused bitter envy among his contemporaries. At the coronation of Charles I (1633) Alexander became Earl of Stirling. His last years were embittered by great pecuniary reverses and he died insolvent. In strength of character, integrity and many-sidedness he was the greatest Scotchman of his time; took a conspicuous place as scholar, courtier, colonizer and poet. As a poet he belongs to the type of Fulk Greville and Lord Brooke; his tragedies are labored; but some minor pieces like the 'Aurora' are elegant and musical. Milton read his works and Addison praised them highly. The earliest editions of them are eagerly sought after. Chief among them are 'Tragedie of Darius' (1603); 'A Paræ nesis to the Prince' (1604).

ALEXANDER, William, American general in the Revolutionary War, known as "Lord Stirling": b. New York 1726; d. Albany, 15 Jan. 1783. He entered the service as a colonel of militia, was taken prisoner at the battle of Long Island, where he commanded a brigade, and served through the New Jersey campaigns with Washington. His claim to the title and estates of Stirling was disallowed by the English House of Lords in 1761 and on his return to America he took an active part in the troubles leading up to the Revolution. He was a member of the first board of governors of King's College, now Columbia University.

ALEXANDER ARCHIPELAGO, or **ALEXANDER ISLANDS,** a group of islands on the west coast of North America, extending from 54° 40′ N. to 58° 25′ N.; belong to Alaska Territory. The principal islands are Baranoff and Prince of Wales.

ALEXANDER COLUMN, in Petrograd, erected in 1832 in honor of Alexander I (1777–1825). The total height is 154¾ feet. The polished shaft of red granite, 84 feet high and 14 feet in diameter, is the greatest modern monolith.

ALEXANDER LAND, an area in the Antarctic Ocean, discovered by Bellinghausen in 1821. It is in lat. 68°, long. 70° to 75°.

ALEXANDER, Romance of, a romance of the Middle Ages, based on a fabulous account of Alexander's invasion of Asia, written by Callisthenes. In some form it makes a part of all the literatures of Europe and western Asia.

ALEXANDERS, a name applied to *Smyrnium olusastrum,* of the family *Apiaceæ.* The plant is a native of Europe and was formerly cultivated for its leaf-stalks, which may be blanched like celery. It is now rare in cultivation because of its inferiority to celery.

ALEXANDER'S FEAST. Dryden, in his 'Alexander's Feast or the Power of Music,' an 'Ode in Honour of St. Cecilia's Day' (1697), wrote in the form of Cowley's irregular ode, but in place of the broken-winded rhythms of the "Pindarick" made use of his own firm verse-music. Ten years before he had written on the same model 'A Song for St. Cecilia's Day' in which he had expressed the idea that the eternal harmony of the universe was to be perceived in the varying effects of music on human emotions, and in the rhythms of his poem attempted to suggest the appealing qualities of various musical instruments. In 'Alexander's Feast' he carried the same idea farther, employing now a legend connected with Alexander the Great. This story he tells in such a way as to show how the musician and poet can at will ring the changes upon his hearer's feelings, Alexander being now softened, exalted or infuriated according to the turns of harmony brought to bear upon him by Timotheus. The success of the poem is largely in the skill with which the verse is varied to suit Dryden's purpose, but also in its effective imagery and narrative power. The author's great command of phrase is also evident throughout, as one may see in the closing lines of the first and last stanzas. 'Alexander's Feast' had a noteworthy effect upon later lyric poetry, particularly upon the odes of Gray.

William Haller.

ALEXANDRA Caroline Marie Charlotte Louise Julie, Dowager Queen of England, daughter of Christian IX, King of Denmark: b. Copenhagen, 1 Dec. 1844. On 10 March 1863 she was married to Albert Edward, Prince of Wales; she has had three sons, two of whom have since died, and three daughters. She made several visits to Denmark and a visit to Russia at the time of the death of Alexander III. She took an active part in very many benevolent enterprises and became very popular in England. When Albert Edward succeeded to the throne in 1901 as Edward VII she became Queen of England and reigned with him until his death, 6 May 1910. In 1913 she celebrated the fiftieth anniversary of her wedding and of her arrival in England. She has borne a noble part in the various humanitarian activities incident to the great European War. Consult Tooley, S. A., 'Queen Alexandra' (London 1902).

ALEXANDRETTA (the ancient Alexandria ad Issum), a small seaport in Syria, on the southeast coast of the Gulf of Iskanderoon. It is the natural port of Aleppo and northern Syria, and the residence of a United States vice-consul. The port is a fine bay, running southeast from the Gulf. The annual imports, about $10,000,000, are chiefly grain, rice and salt; the exports, about $6,500,000, are galls, silk, cotton and dips or beshmet (a preparation from grapes, used by the natives as food). In 1915, in the European War, the railway station, wharf and warlike stores were destroyed by British forces. Pop. about 9,000.

ALEXANDRIA (Iskanderieh of the Turks), an ancient city and chief seaport in

Egypt, about 14 miles west of the Canopic mouth of the Nile, on the ridge of land between the sea and the bed of the old Lake Mareotis, 129 miles by rail northwest of Cairo. Ancient Alexandria was founded by, and named in honor of, Alexander the Great, in 332 B.C., on the site of a village called Rhakôtis or Racoudah. Its plan was sketched by the architect Dinocrates. It stood nearly on the site of the present town, though the configuration of the land has altered considerably since then. It attained its greatest prosperity in the days of the Ptolemies, who made it their capital. Under the Romans it became the capital of Egypt, and even when captured by Amru, general of the Caliph Omar (A.D. 641) it contained "4,000 palaces, 4,000 baths, 400 theatres or places of amusement, 12,000 shops for the sale of vegetables, and 40,000 tributary Jews" (Gibbon). The city was regularly built and traversed by two principal streets, each 200 feet wide. It consisted of three quarters, that of the Jews, the *Rakôtis*, or the people's quarter, and *Brucheion*, or the quarter of the palace. In the 1st century B.C. it had about 500,000 inhabitants. One-fourth of the area upon which it was built was covered with temples, palaces and public buildings, the most conspicuous being the famous lighthouse, one of the seven wonders of the world, upon the little island of Pharos, which was connected with the city by a mole, called the Heptastadion, nearly a mile long; the splendid temple of Jupiter Serapis; the Library, at that time the richest in the world (see ALEXANDRIAN LIBRARY); the Museum, a kind of academy in which learned men of every description were entertained at the expense of the state; an immense hippodrome; the temple of Poseidon, and the Cæsareum, beside which stood the two obelisks known as Cleopatra's Needles, one of which was taken to London in 1878; the other to Central Park, New York, in 1881. The largest well-preserved monument of antiquity in modern Alexandria is the so-called Pompey's Pillar, a red granite column 88 feet high (including pedestal), on the site of the Serapeum, thought to have been erected in the 4th century either in honor of the Emperor Diocletian or to commemorate the destruction of the Serapeum.

Alexandria was one of the chief granaries of Rome, and apart from its commercial importance was a great centre of learning. On the introduction of Christianity in the 1st century it became the seat of Christian erudition and the orthodox faith, and was frequently torn by bloody religious dissensions. After the Mohammedan conquest (7th century) its importance rapidly declined. In the 19th century under the vigorous rule of Mehemet Ali, it recovered a large degree of prosperity, and is to-day one of the most important commercial ports on the Mediterranean. It was bombarded by the British 11 July 1882. See EGYPT.

The Mohammedan quarter of the present city is chiefly built on the mole, which has been increased by alluvial deposits till it has become a broad neck of land between the two harbors. The European quarter is on the mainland south of the east harbor. It swarms with cafés, shops and theatres, and is lighted with electricity. The finest residences and official buildings surround the Mohammed Ali square. Alexandria has two harbors; the east harbor (Great Harbor of Antiquity) is now accessible only to fishing boats. The west harbor is divided into an outer harbor, about 1,700 acres in area, protected by a breakwater of solid masonry about two miles long, and an inner harbor 464 acres in area, average depth 28 feet, also protected by a mole 1,000 yards long. It is entered and cleared annually by over 2,000 steamers. In 1912 exports, chiefly cotton, grain, cottonseed, rice, sugar, beans, etc., amounted to $168,951,280; imports to $110,785,145. The city acquired a modern drainage system in 1905 and a new water supply in 1906. The population in 1907 was 332,246; in 1914 it was estimated at 400,000, of whom 60,000 were Europeans, mostly Greeks and Italians. There is railway communication with Cairo and Suez; the Mahmoudieh Canal, made by Mehemet Ali, connects Alexandria with Cairo and the Nile.

ALEXANDRIA, Canada, town in Glengarry County, Ontario, half way between Montreal and Ottawa on the Grand Trunk Railway. It has carriage and cabinet works, and foundries. Pop. 2,323.

ALEXANDRIA, Ind., a city in Madison County, 50 miles northeast of Indianapolis, on the Cleveland, C., C. & St. L., Michigan div., and Lake Erie and W. railroads, and Union Traction Company of Indiana. It is in a natural gas region, but the supply has failed of recent years and industrial prosperity has suffered. There are important glass and lamp chimney factories, preserving plants, and manufactures of paper, rockwood products, mirrors, wire-fence, road-drags, steel wheels, etc.; almost all factories are situated outside the city limits, which makes the value of taxable property only $1,226,000. There are two banks, four public schools, one of which is a high school, a Carnegie library, several city buildings, municipal water and lighting plants; churches, and daily, tri-weekly and weekly newspapers. It was settled in 1834, and is governed by a mayor, elected for four years, a council of five members, clerk and treasurer. The annual income for running expenses is about $30,000; expenses in 1915 about $27,000. Pop. (1915) 5,000, with suburbs, 6,000.

ALEXANDRIA, La., city and parish seat of Rapides Parish, 193 miles northwest of New Orleans, and on the T. & P., St. L., Iron Mt. and So. (2 divisions), M. L. & T. S. S. Co. (Son. Pas.), Rock Ls., L. & Ark., Alex. & W. and the Louisiana Railway & Navigation Company. It is in the midst of fine alluvial lands, devoted chiefly to truck, cane and cotton growing. Strawberries and other fruits are raised across the river. The main industries of the city are truck and general farming, cottonseed oil mills, pine and hardwood mills, hoop and barrel and silo factories, woodworking plants, etc. There are four large banking institutions, three investment companies, two savings banks and two building and loan associations. The value of taxable property is $25,000,000. Alexandria has four large public schools, equipped with the latest facilities, with 3,000 pupils, private and denominational schools and a convent of the Sisters of Mercy. It has a number of miles of asphalt street paving. Among the public buildings are the city hall, court house, opera house, high schools, public library, ho-

tels and office buildings and insane asylum. There are 30 miles of good gravel roads in every direction. Alexandria was once a trading post of the French and Spanish and was incorporated in 1819. In 1864 it was almost entirely destroyed by fire. Its present prosperity began when the Texas and Pacific Railroad was extended here in 1882. It has the commission form of government and the street railways and electric light and water works are owned by the municipality. The city's receipts in 1914–15 were $295,011; expenses, $250,912. Pop. (1915) 20,000.

ALEXANDRIA, Minn., city and county-seat of Douglas County, 130 miles northwest of Minneapolis, on the Great Northern and the Minneapolis, St. Paul and Sault Ste. Marie railroads. It is located in a stock raising and wheat district and has manufactories of flour, furniture, boats, launches, sleighs, cutlery, stoves, wagons and beer. There is a large refrigerating plant located here. The city has considerable reputation as a summer resort. The electric lighting plant and water works are the property of the municipality. Pop. 3,200.

ALEXANDRIA, Va., city and port of entry of Alexandria County, situated on the Potomac River, the Pennsylvania, the Southern, the Atlantic Coast Line, the Baltimore and Ohio, the Seaboard Air Line and the Chesapeake and Ohio, and trolley line connecting with Washington, D. C., and Mount Vernon; six miles south of Washington. The river here expands to the width of a mile and gives the city an excellent harbor that will accommodate the largest vessels. The city is an important trade centre, and is noted for its educational institutions, which include Washington High School, Potomac, Mt. Vernon and St. Mary's academies, and nearby the Theological Seminary and High School of the Diocese of Virginia (Protestant Episcopal). The city's manufactures include glass, fertilizers, pumps, silks and thread, and there are also machine shops and breweries. The United States census of 1914 recorded 49 establishments of factory grade employing 1,716 persons, of whom 1,503 were wage earners, receiving $857,000 in wages. The capital engaged amounted to $4,573,000, and the output was valued at $3,660,000; of this $1,701,000 was added by manufacture. There are four national banks, public school property valued at $35,000, and daily and weekly periodicals. Among the objects of special interest are the public library, the Confederate monument entitled "Appomattox," the Marshall House, and Old Christ Church, of which Washington was one of the first vestrymen, and which contains his pew and that of General Lee. General Braddock made his headquarters at Alexandria (originally called Belhaven) in 1755. During the Civil War it was the capital of that part of Virginia which adhered to the Union; and in 1861 Colonel Ellsworth, an officer in Major-General McDowell's army, was shot after tearing down a Confederate flag which floated from the Marshall House. Alexandria was first incorporated in 1749. It is governed, under a charter of 1879 revised in 1895, by a mayor and bicameral city council, which elects the minor officers; the more important ones such as the treasurer, auditor, etc., being elected by the people.

ALEXANDRIA BAY, N. Y., a village in Jefferson County on the Rome, W. & O. Railroad about 70 miles northeast of Oswego. It is a prominent resort of the Thousand Islands. Pop. (1910) 1,899.

ALEXANDRIAN AGE, or SCHOOL, the school or period of Greek literature and learning that existed at Alexandria in Egypt during the 300 years that the rule of the Ptolemies lasted (323–30 B.C.), and continued under the Roman supremacy. Ptolemy Soter founded the famous library of Alexandria (q.v.) and his son, Philadelphus, established a kind of academy of sciences and arts. Many scholars and men of genius were thus attracted to Alexandria, and a period of literary activity set in which made Alexandria for long the focus and centre of Greek culture and intellectual effort. It must be admitted, however, that originality was not a characteristic of the Alexandrian age, which was stronger in criticism, grammar and science than in pure literature. Among the grammarians and critics were Zenodotus, Eratosthenes, Aristophanes, Aristarchus and Zoilus, proverbial as a captious critic. Their merit is to have collected, edited and preserved the existing monuments of Greek literature. To the poets belong Apollonius, Lycophron, Aratus, Nicander, Euphorion, Callimachus, Theocritus, Philetas, etc. Among those who pursued mathematics, physics and astronomy was Euclid, the father of scientific geometry; Archimedes, great in physics and mechanics; Apollonius of Perga, whose work on conic sections still exists; Nicomachus, the first scientific arithmetician, and (under the Romans) the astronomer and geographer Ptolemy. Alexandria also was distinguished in philosophical speculation, and it was here that the New Platonic school was established at the close of the 2d century after Christ by Ammonius of Alexandria (about 193 A.D.), whose disciples were Plotinus and Origen. Being for the most part Orientals, formed by the study of Greek learning, the writings of the New Platonists are strikingly characterized — for example, those of Ammonius Saccas, Plotinus, Iamblicus Porphyrius — by a mixture of Asiatic and European elements. The principal Gnostic systems also had their origin in Alexandria.

ALEXANDRIAN LIBRARY, a remarkable collection of books, the largest of the ancient world, was founded by the first Ptolemy and fostered by his son. It quickly grew and, already in the time of the first Ptolemy, Demetrius Phalereus had 50,000 volumes or rolls under his care. During its most flourishing period, under the direction of Zenodotus, Aristarchus of Byzantium, Callimachus, Apollonius Rhodius and others, it is said to have contained 490,000, or, according to another authority, including all duplicates, as many as 700,000 volumes. The greater part of this library, which embraced the collected literature of Rome, Greece, India and Egypt, was contained in the famous museum, in the quarter of Alexandria called the Brucheion. During the siege of Alexandria by Julius Cæsar this part of the library was destroyed by fire; but it was afterward replaced by the collection of Pergamos, which was presented to Cleopatra by Mark Antony. The other part of the library was

kept in the Serapeum, the temple of Jupiter Serapis, where it remained till the time of Theodosius the Great. When this emperor permitted all the heathen temples in the Roman empire to be destroyed, the magnificent temple of Jupiter Serapis was not spared. A mob of fanatic Christians, led on by the Archbishop Theophilus, stormed and destroyed the temple, together, it is most likely, with the greater part of its literary treasures, in 391 A.D. It was at this time that the destruction of the library was begun, and not at the taking of Alexandria by the Arabs under the Caliph Omar, in 641. There are strong reasons for believing that no library then existed there. Consult Petit-Radel, 'Recherches sur les Bibliothèques Anciennes et Modernes' (1819); Ritschl, 'Die Alexandrinische Bibliothek' (1838); Weniger, 'Das Alexandrinische Museum' (1875).

ALEXANDRIAN VERSION, or CODEX ALEXANDRINUS (CODEX A.), a Greek manuscript of the Bible, now in the British Museum, of great importance in Biblical criticism. It is on parchment, with uncial letters, without breathings and accents or spaces between the words. It was written probably in the middle of the 5th century and contains, in four volumes, small folio, the whole Greek Bible, two letters of Bishop Clement of Rome to the Corinthians, the genuine epistle and a fragment of the second, the spurious one, and eight psalms of Solomon, so-called. The first three volumes contain the translation of the Old Testament; the fourth, the New Testament. A large part of the Gospel of St. Matthew and of the Second Epistle to the Corinthians, as well as a portion of the Gospel of St. John, are wanting. The patriarch of Constantinople, Cyrillus Lucaris, who in 1628 sent this manuscript as a present to Charles I, said he had received it from Egypt; and it is evident from other circumstances that it was written there. But it cannot be decided with certainty whether it came from Alexandria (whence its name). It is said, however, to have belonged to the patriarch of Alexandria at the end of the 11th century. John Ernest Grabe followed it in his edition of the Septuagint (Oxford 1707–20, 4 vols. folio). Dr. Woide published the New Testament (London, folio, 1786), with types cast for the purpose, page for page and line for line, as in the manuscript itself. A somewhat more accurate text of the New Testament in ordinary Greek type (with the lacunæ supplied) was published by R. H. Cowper in 1860. Henry Hervey Baber edited a facsimile edition of the Old Testament (London 1816–28, 3 vols., folio). In 1864 the complete text, along with three other of the oldest texts of the Bible, was published at Oxford, the work being arranged in parallel columns. An autotype facsimile of the whole codex in four volumes was published by the British Museum in 1879–83. The text of this manuscript is of most importance in the criticism of the Epistles of the New Testament; in the Gospels the text is not so good.

ALEXANDRINE, al'ĕg-zăn'drin, the name of a verse, which consists of six feet (or of 6½ with female rhymes), equal to 12 syllables, the pause being in correct Alexandrines always on the 6th syllable; for example, the second of the following verses (from Pope's Essay on Criticism):

> "A needless Alexandrine ends the song
> That, like a wounded snake, drags its slow length along."

The only complete English poem of literary importance written in this measure is Drayton's 'Polyolbion.' The concluding line of the Spenserian stanza is an Alexandrine. The French in their epics and dramas are confined to this verse, which for this reason is called by them the Heroic. The Alexandrine derives its name from an old French poem belonging to the middle of the 12th or the beginning of the 13th century, the subject of which is Alexander the Great, and in which this verse was first made use of.

ALEXANDRISTS. In the period of the Renaissance there came to be a vigorous controversy between the adherents of different traditions of Aristotelianism. The chief schools of the Aristotelians were the *Thomists*, or followers of Thomas Aquinas, the *Averroists*, or followers of Averroes, and the *Alexandrists*, or followers of Alexander of Aphrodisias (about 200 A.D.). The chief point at issue among these three schools was that of the existence and nature of immortality. The Thomists, of course, as the advocates of the orthodox doctrine of the Catholic faith, held that the intellect retained its individuality after death. Alexander and his followers, on the other hand, believed that the intellect was double in nature, containing a passive, formless, mortal part, connected with the lower psychical functions and acting as a *tabula rasa* in its reception of the active intellect which, though immortal, was not regarded by Alexander as individual. Indeed, he identified this active intellect with the Deity. Averroes really held practically the same view as Alexander, but differed in his terminology, for what Alexander called the passive intellect was regarded by Averroes as a mere non-intellectual disposition, while what Averroes called the passive intellect is the result of the particularization of the active intellect by contact with the specific dispositions of the minds of different individuals. Averroes did not identify active intellect with the Deity, but with an emanation of the Deity; however, he attributed to it immortality. Similar as were the views of Alexander and Averroes, in the Renaissance the followers of Alexander put their chief emphasis on the mortality of the passive reason, the Averroists on the non-individual immortality of the active reason, so that a violent antagonism developed between the two schools which soon attached itself to many other points. The chief Averroists were Nicoletto Vernias (?–1499), Alexander Achillini of Bologna (?–1518), Augustino Nifo (1473–1546), Zimara (?–1532). The chief Alexandrists were Ermolao Barbaro (1454–93), Pietro Pomponazzi (1462–1524), Gasparo Contarini (?–1542), Simon Porta (?–1555), Scaliger (1484–1558). The chief Thomist was Francis Suarez of Granada (1548–1617).

ALEXANDRITE, a variety of the mineral chrysoberyl (q.v.). It occurs in twin crystals (trillings) and is chiefly remarkable for the fact that while by daylight its color is a dark emerald to grayish-green, it assumes a beauti-

ful columbine-red color by artificial light. Because of this property and owing to its rarity and great hardness (8.5), it is highly prized as a gem. Its name, given in honor of Alexander II of Russia, seems singularly appropriate when it is recalled that the gem is said to have been first discovered in the emerald mines of Takowaja, Siberia, on the very day on which the then heir apparent attained his majority, and further that the green and red colors of alexandrite are the national colors of Russia. The finest alexandrites still come from Siberia, but good gems are occasionally found in Ceylon.

ALEXANDROPOL, Russia (formerly GUMRI), Russian military town and fortress in the trans-Caucasian government of Erivan, situated on a bare plateau near the highway from Erivan to Kars. There is accommodation in the military quarters for a force of 10,000 men. The town has several churches and caravansaries, and there are extensive silk manufactories. Pop. 49,000.

ALEXEI MIKHAILOVITCH, 2d Russian tsar of the line of Romanof: b. 1629; d. 1676. He succeeded to the throne in 1645 on the death of his father, Michael Feodorovitch. The first years of his reign were marked by various disturbances due in great part to his youth and inexperience. By 1655 he had restored peace at home and began to look abroad for realms to conquer. He conducted two campaigns against Poland (1654–56 and 1660–67), captured Smolensk, overran Lithuania and seized several provinces. He also took part of the Ukraine, and waged a war against Sweden in 1657–58. He greatly extended Russian influence in the East, sent several raiding parties of Cossacks into Asia and made an attack on China. At home he introduced important modifications of the legal code, had translations made of numerous scientific works, military works, etc., and also instituted some ecclesiastical reforms. His private character appears to have been above reproach. By his second wife, Natalia Naryshkin, he was the father of Peter the Great.

ALEXEI PETROVITCH, the eldest son of the Tsar Peter the Great and Eudoxia Lapuchin: b. Moscow 1690; d. St. Petersburg 7 July 1718. He opposed the innovations introduced by his father, who on this account determined to disinherit him. Alexei renounced the crown, and when Peter set out on his second journey he made his escape in 1717 to Vienna, where he sought the protection of his brother-in-law, the German Emperor, and thence to Naples, under the pretext of going to his father, who had sent for him. At the command of Peter he returned; but the enraged Tsar, regarding his flight as an act of treason, disinherited him by a ukase of 2 Feb. 1718; and when he discovered that Alexei was paving the way to succeed to the crown he not only caused all the participators of his project to be punished capitally or otherwise, but had his son also condemned to death, and the sentence read to him, as pronounced unanimously by 144 judges. Although he was soon afterward pardoned, the fright and anxiety which he had experienced affected him so much that he died in the course of four days. It is supposed by some that he was poisoned. The Tsar, to avoid scandal, ordered the proceedings at the trial to be published. He left a daughter and a son, afterward the Emperor Peter II. Consult Bain, 'The First Romanovs' (London 1905).

ALEXEIEFF, Michael Vassilivitch, ä-lĕxā'yief, Russian general: b. Tver about 1848. Educated at the Classical Gymnasium in his native town, he passed to the Moscow Military Academy and was attached to a Kazan regiment in 1876, attaining the rank of captain in 1885. Ambition led him, about 1879, to enter the Academy of the General Staff, where he assiduously studied till 1890. During the next eight years he was employed in the administrative routine of army work, and in 1898 became professor of military science at the Staff Academy. When the Russo-Japanese war broke out in 1904 Alexeieff was appointed quartermaster-general of the 3d Manchurian army. In the battle of Mukden he commanded a brigade of infantry and a body of Cossacks. He defended the position at Tsinkhechen with 16 battalions and 20 guns against the fierce onslaughts of the Japanese for several days. From 1908 to 1912 he was chief of staff of the military district of Kiev. At the outbreak of the European War he was in command of the 13th Army Corps at Smolensk. Alexeieff had literally risen from the ranks by sheer merit; the offspring of a poor family — his father was a humble sergeant — he had no influence behind him beyond his laboriously acquired reputation for tremendous energy, capacity for hard work and an iron determination. In the great struggle to which Russia was committed in 1914 he showed his ability not only by his general grasp in matters of statecraft as well as strategy, but also by the immutable calm and simplicity which never forsook him during the severest ordeals of responsibility. Alexeieff first became chief of staff in General Ivanoff's southern army group; then commander of the Army of the Bukovina; he next succeeded General Ruzsky as commander-in-chief of the northwestern group, where he had control of nine out of 12 of the Russian armies and was directly concerned in carrying out the invasion of Galicia and afterward the retreat from Warsaw. In the northwestern command his difficulties were aggravated by his inability, for technical reasons, to assume the offensive — a fact of which the German staff were fully aware. Whilst the enemy could safely undertake active operations at any point that might be chosen, it was the task of Alexeieff to anticipate and counter these movements. Scarcely had the Galician crisis passed than he was summoned as chief of staff to the Generalissimo, the Grand Duke Nicholas, who retired as viceroy of the Caucasus in September 1915, when the Tsar formally took command of the Russian armies, immediately appointing Alexeieff chief of the general staff — virtually supreme commander under a shadowy superior. With the downfall of Tsarism in the revolution of 1917 he was appointed commander-in-chief, which post he resigned in June 1917 to become military adviser to the provisional government. He was succeeded by General Brusiloff (q.v.). Subsequently Alexeieff again became chief of the general staff under Premier Kerensky, but resigned again in September 1917 owing to disagreement, it is said, over the dismissal of officers implicated in the

abortive Korniloff counter revolution. See WAR, EUROPEAN.

ALEXIA. See APHASIA.

ALEXIAD, a life of the Emperor Alexius Comnenus (q. v.) by the Princess Anna Comnena, his daughter. This work, which is one of the most important authorities for the history of the closing years of the 11th century, is written in modern Greek and divided into 15 books. It gives a vivid picture of the First Crusade.

ALEXIAN BROTHERS. See CELLITES.

ALEXIS, Greek comic poet, a native of Thurii, in Magna Græcia, afterward an Athenian citizen: b. about 394 B.C., and is known to have lived as late at least as 288 B.C. He was the uncle and instructor of Menander, and is said to have written 245 plays.

ALEXIS NICOLAIEVITCH, GRAND DUKE, ex-heir apparent (Tsarévitch) to the Russian throne: b. 30 July (N.S. 12 Aug.) 1904. The birth of a son to the Tsar caused great rejoicing in Russia; the imperial couple had four daughters, and there seemed reason to apprehend that the throne would not descend in the direct line of succession. The young heir proved to be of a bright, active and intelligent disposition, thoroughly Russian in all his tastes. In common with several of his near relations, however, he had a serious organic affliction consisting of a tendency to internal hemorrhage which might be brought about by any slight accident. This tendency is hereditary in the Romanoff family, and in this case has been the source of grave concern. Until the birth of Alexis, the younger brother of Nicholas II, the Grand Duke Michael (b. 1878), was heir apparent to the throne. It was then decided that, in the event of the Tsar's death before the young child attained his majority, the Grand Duke should act as regent for him in conjunction with the dowager Empress. This formal arrangement, however, was canceled some years ago when he contracted a morganatic marriage with a divorcée. He thereafter lived abroad and disappeared from public view until the outbreak of the European War, when he returned to Russia and served in the army. After the deposition of the Tsar in March 1917 he was appointed regent — an arrangement that lasted but a short while.

In October 1912 a sensation was caused by a rumor that the young heir — then eight years old — had been the victim of a bomb outrage, while another story ran that he had been mutilated by his nurse. All that could be gathered of a definite nature was the fact that he was in a critical condition of health. An official statement issued on 3 November announced that the child had injured himself by jumping into a boat, which had induced hemorrhage and would require a long period of recuperation. The question of succession rose again. The Grand Duke Michael having been eliminated, an heir-designate was appointed in the Grand Duke Dmitri (b. 1891), son of the Tsar's uncle, the Grand Duke Paul. The child recovered in due course, and assisted his father in distributing decorations among the troops at Tsarskoe Seló in December 1914. In the fall of 1915 he accompanied the Tsar to the front and for a time shared the military life at the imperial headquarters. Dressed in a little Cossack uniform, he joined his father in tours of inspection and made himself a great favorite with the soldiers. When the Russian revolution became an accomplished fact in March 1917, M. Alexander Gutchkoff and a deputy were commissioned to go to General Ruzsky's headquarters and inform the Tsar that he had ceased to reign. Realizing the hopelessness of his situation, the dethroned monarch asked the delegates, "What do you want me to do?" He was told that he must abdicate in favor of his son under the regency of the Grand Duke Michael. The Tsar replied, "I cannot part with my boy; I shall hand the throne to my brother. Have you a piece of paper?" A manifesto was drafted on the spot; the Emperor of all the Russias for the last time appended his signature as a monarch, laying down the supreme power and renouncing all rights of succession on behalf of his son. The document was signed at Pskoff on 15 March 1917. The boy was sick at the time; his four sisters were suffering from measles, which disease he also eventually contracted. He subsequently accompanied his parents into exile.

ALEXIS, Wilibald, pseudonym of Wilhelm Häring (q.v.).

ALEXIUS (COMNENUS), Emperor of Constantinople: b. 1048; d. 15 Aug. 1118. He was the third son of John Comnenus, the Emperor Isaac's brother. Naturally clever, he was carefully educated under the direction of his mother; and at the age of 14 took part in an engagement with some European adventurers commanded by a Scot called Russel de Balliol, of whom the youthful warrior afterward became an intimate friend. After several successive emperors had tasted for a brief season the "bitter sweets" of a nominal supremacy over a country torn by anarchy, Alexius, with the aid of the army, was proclaimed emperor, seized on Constantinople, which he permitted his soldiers to pillage, and shut up the nominal ruler in a monastery (1081). The empire was then in a deplorable state. The Turks were profiting by these intestine dissensions to seize upon the Asiatic provinces while Robert Guiscard and his Normans were menacing the west, and fierce swarms from beyond the Danube threatened the nearer provinces. However, Alexius did not despair; he sent supplies of money to his ally Henry IV of Germany to enable him to attack Rome, the Pope (Gregory VII) being a firm friend of the Norman leader. His Holiness had to flee, and Guiscard hastened to his aid, leaving in Greece his son Bohemond, who gained two victories over Alexius; but famine and disease weakened the Norman army, which Robert could not rejoin, as he was detained in Italy by a revolt of his vassals. In 1084 he returned to the charge, and after gaining some advantages he suddenly died of an epidemic; although some ascribe his death to poison administered by one of Alexius' secret agents. In consequence of this event the Normans abandoned all their conquests, and Alexius turned his attention to the Turks and Scythians, whom, after an arduous struggle, he completely defeated. Scarcely was this accomplished when, in 1096, the bands of the First Crusade arrived at Constantinople demanding aid, rudely menacing him in his own palace,

and finally compelling him to join them. The alliance did not last long; a war broke out between the Emperor and the Crusaders, which ended in the defeat of the latter. The rest of Alexius' life was employed in consolidating his conquests and restoring orderly government in his states, which were much disturbed by heresies. He died at 70, after a reign of 37 years. He extended his empire; and for its defense he left to his successors a well-disciplined army, which he had wholly created himself. Historians differ respecting his conduct and abilities; his daughter Anna wrote his life (the Alexiad).

ALEYRODIDÆ, a family of plant-lice. See WHITE FLY.

ALFALFA, also called LUCERNE (q.v.) (*Medicago sativa*), is a herbaceous plant belonging to the family *Fabaceæ*. The leaves are pinnate-trifoliate; its flowers small, generally purple in color, dense in spikes. The plant is a native of Asia, but has been cultivated in Europe since before the time of Christ. The Spaniards introduced it into South America, but it did not reach North America until some time between 1850 and 1860, when it was introduced into California. Since then it has become the most extensively cultivated forage crop in the United States. Its adaptability to varying conditions of soil and climate gives it an extensive range, extending from the arid lands of the West, where irrigation is required, to the richer soils of the East, and from sea-level to heights of over 7,000 feet. It will not flourish in extremely damp or clayey soils. Its roots strike to great depths, so that it withstands droughts better than most of the forage plants. It is cut when coming into bloom, and yields from three to 12 tons of hay to each acre. In some regions it is cut every month in the year. It is particularly valuable as a green manure, as it takes nitrogen from the air, and its deep-growing roots draw from the lower soils large quantities of lime, phosphoric acid, potash and other minerals useful as crop foods. Alfalfa is relished by cattle whether green, as hay, or as ensilage, but to secure the best results it should be fed with root crops and grain, which add the ingredients needed for a well-balanced ration. Alfalfa is subject to two fungus diseases, one on the leaf and another on the root, either of which, if not checked, will spread and ultimately ruin the field. It is also attacked by certain insects. The *Farmers' Bulletins* issued by the United States Department of Agriculture and the bulletins of the various State agricultural experiment stations give full information on the culture of the plant and the treatment of its diseases.

The importance of the alfalfa industry in the United States is indicated by the fact that the area devoted to alfalfa in 1909 was approximately 4,638,662 acres. In the same year approximately 15,829,680 pounds of seed were harvested and about 11,800,000 tons of hay produced . Consult Westgate, J. M., 'Alfalfa,' Farmers' Bulletin 339, U. S. Department of Agriculture (1915); Westgate, J. M., McKee, R. and Evans, M. W., 'Alfalfa Seed Production,' Farmers' Bulletin 495, U. S. Department of Agriculture (1915); Fortier, S., 'Irrigation of Alfalfa,' Farmers' Bulletin 373, U. S. Department of Agriculture (1915). For alfalfa diseases and enemies consult Kalmbach, E. R., 'Birds in Relation to the Alfalfa Weevil,' U. S. Department of Agriculture Bulletin No. 107; also Farmers' Bulletins Nos. 636, 637, 649 and 741.

ALFALFA MEAL, a meal made by grinding alfalfa hay. The meal is either put on the market just as it is ground or is mixed with other concentrates, such as molasses, bran and corn chop. The advantages of alfalfa meal lie in the fact that it is usually fed with less waste than the hay; the hay used for the meal is generally of better quality and has a higher percentage of protein than the ordinary hay. There is also considerable advantage to be derived from the reduction of freight charges. It is also a convenient form for special purposes, such as city trade and where the product has to be shipped to a distance. Alfalfa meal is an excellent feed for poultry.

ALFARABI, an eminent Arabian philosopher of the 10th century. He was a native of Farab, in Asia Minor, his proper name being Abu Nasr Mohammed ben Mohammed ben Tarkhan; d. Damascus 950. His works consist of treatises on different parts of the Aristotelian philosophy. He excelled in music and philology as well as in philosophy; and one of his most famous works is a kind of encyclopædia, in which he gives a brief account and definition of all branches of science and art. The manuscript of this is in the Escurial. His works were printed in Paris in 1638.

ALFIERI, Vittorio, Italian tragic poet: b. Asti, Piedmont, 17 Jan. 1749, of parents, as he tells us in his 'Autobiography,' "noble, well-to-do and honest"; d. Florence, 18 Oct. 1803. The 'Vita di Vittorio Alfieri da Asti scritta da esso' ("Life of Vittorio Alfieri written by himself") furnishes the material for any sketch of his life and is in itself a remarkable work, not infrequently mentioned with the like notable autobiographies of Cellini and Goldoni. Alfieri divides his biography into four parts, characterizing each of them summarily and aptly: Infancy (nine years of vegetation); Childhood (eight years of non-education); Youth (10 years of travel and dissipation); Manhood (30 and more years of composition, translation and study). His parents were Antonio Alfieri and Monica Maillard de Tournon, of Savoy origin as the surnames indicate. In early infancy Alfieri lost his father and was entrusted to the care of an uncle, but lived with his mother, who in the following years was twice married. In 1758, when nine years of age, following the period of "vegetation," Alfieri entered the Academy of Turin, where his "non-education," consisting largely of routine and the pursuit of an unprofitable curriculum duly impressed him with the worthlessness of much that passes for academic culture. It was here, however, that he made his first poetical effort, a sonnet imitated from the verse of the only poets with whom he was acquainted, having, moreover, read them furtively, Ariosto and Metastasio. In 1763, when Alfieri was 14 years old, his uncle died, bequeathing him property and leaving him in control of his father's large fortune and estate. He could now satisfy some of his longings, one of which, his love of horses, amounted to a passion, "the third passion of his soul." After

his eight years of "non-education" in the Turin Academy, in 1766 he served for a short period as a standard-bearer in the regiment at Asti and then entered upon his period of youth, or "10 years of travels and dissipation." His first travels (1766–68) were through Italy, France, England and Holland. He appears to have become dissatisfied with Paris, contracting a dislike for France and its people which became accentuated later on and to which he gave vent in his 'Misogallo' ("Anti-Gallican"). It was in Holland that he had one of his serious love affairs with a married lady. He next traveled (1769–71) through Germany, Denmark, Switzerland, Belgium, Russia, Prussia, Holland and England. He was obliged to leave England on account of another love affair with a married lady, attended with serious consequences. He resumed his travels (1771–72) through Holland, France, Spain and Portugal, making the acquaintance in the latter country of the Abbé Tommaso de Caluso, whose friendship he retained throughout his life. Upon his return to Turin he led an idle life (1772–74) given up largely to temporal pleasures and to a third infatuation. It was during this period that in order to beguile the weariness of his lady-love, who was ill, he sketched a scene of a tragedy which later on was developed into a five-act play, his first, 'Cleopatra,' and which, perfected, was performed in the Carignano Theatre in 1775. The tragedy was favorably received and gave Alfieri, now in his 27th year, his life's desire, which he immediately undertook to carry out, to become a tragic poet. To accomplish his end he must needs make over his entire education; so he set to work with all of his extraordinary will and passionate effort. He had been used to the French language for literary purposes and wrote his two next tragedies, 'Filippo' and 'Polinice,' in French prose. Upon trying to turn them into Italian he found his knowledge of the Tuscan idiom was far from adequate. He resolved to forget his French and to steep his brain in the best Italian models. For this purpose he went to Florence, thinking in and speaking and writing continually the Florentine idiom. In order to become entirely untrammelled he donated to his sister, the Countess Cumiana, almost his entire property, reserving simply enough upon which to live at his ease. It was in 1777 while in Florence that his last and most celebrated love affair, which lasted throughout the remainder of his life, materialized, a love which he calls "a worthy love," his attachment to the Countess of Albany, a daughter of Gustavus Adolphus, Prince of Stolberg-Geldern, and the wife of Prince Charles Edward Stuart, the Pretender to the English throne. With her Alfieri lived after her separation from Charles, and made his home with her in various places. There is no proof that they were ever married. To the inspiration of the Countess of Albany the 14 tragedies published between 1777 and 1783 are largely due: 'Filippo II'; 'Polinice'; 'Antigone'; 'Agamennone'; 'Virginia'; 'Oreste'; 'La Congiura dei Pazzi'; 'Don Garcia'; 'Maria Stuarda; Rosamunda'; 'Ottavia'; 'Timoleone'; 'Merope'; 'Saul'; and a little later, during his stay in Paris, 'Agide'; 'Sofonisba'; 'Mirra'; 'Abele'; 'Bruto primo' and 'Bruto secondo.' An English translation, by Charles Lloyd, of the tragedies appeared in London, 1815 and 1821. The French Revolution of 1792 brought disaster to both the Countess and Alfieri, the former losing her pension of 60,000 francs bestowed upon the wife of Charles Edward by the French government, and the latter nearly all his worldly goods, comprising the greater part of the complete editions of his tragedies published by Didot. This unfortunate occurrence served to augment his hatred of everything French. The last years of Alfieri were spent quietly in Florence, engaged in literary work. At the age of 48, he began the study of Greek in order to read Homer in the original, as Petrarch and Boccaccio had already done before him. Comforted and encouraged by the Countess, he worked hard to the very end of his life, shortened by overexertion.

By nature ardent, generous, impulsive, loyal to his friends, Alfieri was well fitted to write tragedies. His secretary Polidori, speaking of his temperament, described Alfieri "as proud as the Satan of Milton and as irascible as the Achilles of Homer." His tragedies coming at a time of literary decadence in Italy were by contrast all the more effective, and undoubtedly greatly stimulated his successors, Foscolo, Monti, Pellico, and others. The impulse that, as a poet and a patriot, Alfieri gave to Italy of the 18th century is analagous to what Dante did for his country in the 13th. The beautiful monument by Canova in the church of Santa Croce, Florence, between the tomb of Machiavelli and that of Michelangelo, representing Italy in the form of a woman weeping and lamenting the death of the Poet, was erected by the Countess to the memory of Alfieri.

The tragedies of Alfieri, although taken almost entirely from classical subjects, as their titles indicate, nevertheless are treated by the poet in a manner that is his own, devoid of ornamentation to the point of being, both in language and form, almost stiff and barren, yet the nobility of the sentiment and their lofty ideals have made their author the first tragic poet of Italy. His fame may well rest upon the Tragedies, among which 'Saul' is generally considered the masterpiece, and upon his 'Vita' ("Autobiography"), a work of exceptional interest for its frankness and personal charm. A good edition of the 'Vita' is that edited with notes by Emilio Bertana (Naples 1910). A translation of the 'Vita,' with an essay by W. D. Howells, was issued in Boston, 1877. The best edition of the tragedies is the Pisa edition (22 vols., 1805-15), supplemented by the works published in Florence by the Countess and the Abbé Caluso (in 13 volumes — 8 vo; but not printed in London, as the title-page states).

Among the many works of minor importance are, in prose, 'Del principe e delle lettere,' blaming the patronage given by princes to men of letters; 'La virtù sconosciuta,' a dialogue on the citizen's ideal; 'I giornali'; 'Le lettere'; in poetry, Commedie politiche: 'L'uno,' 'I pochi,' 'I troppi,' 'L'antidoto' ("Political Comedies: The One, The Few, The Too Many, The Antidote"), suggesting remedies for abuses in governments; Commedie sociali: 'La finestrina'; 'Il Divorzio' ("Social Comedies: The Little Widow; Di-

vorce»). The desire to instruct in these comedies is too apparent, nullifying appreciably their small literary value; 'Il Misogallo' («Anti-Gallican») in which, in poetry and prose commentary, he vents his violent hatred of France; Sonnets; Epigrams; 'L'Etruria liberata,' a poem on the assassination of Alexander I, Duke of Florence; a panegyric of Trajan; 16 satires; five odes on American Independence and many translations from the Latin and Greek classics. Consult his 'Autobiography,' translated by Lester (New York 1845); Centofanti, 'Tragedie e Vita d'Alfieri' (Florence 1842); Copping, 'Alfieri and Goldoni: Their Lives and Adventures' (London 1857); Cognetti and Antonini, 'Vittorio Alfieri' (Turin 1898); Holland, 'Builders of Modern Italy' (New York 1908); Howells, 'Life of and Essays on Alfieri' (Boston 1877).

JAMES GEDDES, JR.,
Professor of Romance Languages, Boston University.

ALFONSINE TABLES. See ALFONSO X.

ALFONSO, the name of a number of Portuguese and Spanish kings.

ALFONSO I, the Conqueror, first King of Portugal, son of Henry of Burgundy, the Conqueror, and first Count of Portugal: b. 1110; fought successfully against the Spaniards and the Moors; named himself King of Portugal, and was recognized as such by the Pope; d. 1185.

ALFONSO I, King of Naples and Sicily. See ALFONSO V. (of Aragon).

ALFONSO V, King of Aragon: b. 1385; d. 1458. He was the son of Ferdinand I of Aragon, the throne of which he ascended in 1416, ruling also over Sicily and the island of Sardinia. Queen Joanna of Naples had promised to make him her heir, but at her death in 1435 had left her domains to René of Anjou. Alfonso now proceeded to take possession of Naples by force, which he succeeded in doing in 1442 and reigned till his death in 1458. He was an enlightened patron of literary men, by whom, in the latter part of his reign, his court was thronged.

ALFONSO V, the African, King of Portugal, succeeded his father, Edward I, 1438. Conquered Tangiers; d. 1481. During his reign Prince Henry the Navigator continued the important voyages of discovery already begun by the Portuguese. Under him was drawn up an important code of laws.

ALFONSO X, King of Castile and Leon, surnamed the Astronomer, the Philosopher or the Wise: b. 1226; succeeded to the throne 1252; d. 1284. Being grandson of Philip of Hohenstaufen, son of Frederick Barbarossa, he endeavored to have himself elected Emperor of Germany, and in 1257 succeeded in dividing the election with Richard, Earl of Cornwall. On Richard's death in 1272 he again unsuccessfully contested the imperial crown. Meantime his throne was endangered by conspiracies of the nobles and the attacks of the Moors. The Moors he conquered, but his domestic troubles were less easily overcome, and he was finally dethroned by his son Sancho, and died two years after, 1284. Alfonso was the most learned prince of his age. Under his direction or superintendence were drawn up a celebrated code of laws, valuable astronomical tables which go under his name (Alfonsine Tables), the first general history of Spain in the Castilian tongue, and a Spanish translation of the Bible.

ALFONSO XII, King of Spain. He was the only son of Queen Isabella II and her cousin, Francis of Assisi: b. 1857; d. 1885. He left Spain with his mother when she was driven from the throne by the revolution of 1868 and till 1874 resided partly in France, partly in Austria. In the latter year he studied for a time at the English military college, Sandhurst, being then known as Prince of the Asturias. His mother had given up her claims to the throne in 1870 in his favor and in 1874 Alfonso came forward himself as claimant and in the end of the year was proclaimed by Gen. Martinez Campos as king. He now passed over into Spain and was enthusiastically received, most of the Spaniards being by this time tired of the republican government, which had failed to put down the Carlist party. Alfonso was successful in bringing the Carlist struggle to an end (1876), and henceforth he reigned with little disturbance. He married first his cousin, Maria de las Mercedes, daughter of the Duke de Montpensier; second, Maria Christina, Archduchess of Austria, whom he left a widow with two daughters, a son (Alfonso XIII) being born posthumously.

ALFONSO XIII, King of Spain, son of Alfonso XII and Maria Christina, daughter of Karl Ferdinand, Archduke of Austria: b. after his father's death, 17 May 1886, succeeding by his birth, being a male, his eldest sister. His mother was made queen regent during his minority. On 17 May 1902 the young King formally acceded to the throne and took the oath prescribed by the Constitution, the Queen Regent having taken official leave of the ministry on the 12th. The United States was represented at the ceremony by special envoy. Alfonso married 31 May 1906 Princess Ena of Battenburg, daughter of the late Prince Henry of Battenburg and Princess Beatrice (daughter of the late Queen Victoria). An attempt was made by anarchists to assassinate the King and Queen on their wedding day by throwing a bomb at the royal carriage. Among those arrested in connection with the plot was the celebrated educator, Francisco Ferrer (q.v.), whose execution caused much bitter feeling against the young monarch. He has, however, regained his popularity with the nation and has shown himself to be on the whole a liberal-minded ruler and a supporter of the anti-clerical party. The King has a civil list, fixed by the Cortes (1886), of 7,000,000 pesetas or $1,400,000.

ALFORD, *ăl'fĕrd,* **Henry,** an English poet and miscellaneous writer, philologist, critic, artist and preacher: b. London, 7 Oct. 1810; d. Canterbury, 12 Jan. 1871. He became dean of Canterbury in 1856. An accomplished man, his literary work attracted attention in several departments. Besides sermons and university lectures he wrote 'The School of the Heart, and Other Poems' (1835), his most popular volume of verse; 'The Queen's English' (1866). He was best known by his celebrated edition of the Greek New Testament (1844–52) which, incorporating the results of German Bib-

lical scholarship, formed a landmark in New Testament study in England and America. He was the first editor of the *Contemporary Review*.

ALFRED THE GREAT, King of the West-Saxons: b. 848, at Wantage in Berkshire. He was the youngest son of Æthelwulf, succeeding to the throne in 871, after the three short reigns of his brothers Æthelbald, Æthelbert and Æthelred. The day of his death was 28 October, the year is doubtful, 900 of 901 the weight of the evidence favoring the earlier date. Of the early years of Alfred little is known. The indications are that he was a favorite son. For at the age of five he was sent to Rome by his father, where Pope Leo "hallowed Alfred as King and took him as his bishop's son" (Asser, 'Chronicle'). The allusion to Alfred as "bishop's son" refers to his confirmation, the Pope standing as his sponsor according to a not unusual practice of the times. The allusion to his hallowing as king is less clear; since his three older brothers were still alive, it probably refers to some titular dignity conferred upon him. Two years later Æthelwulf himself went to Rome and Alfred accompanied him. The story of Alfred's learning to read falls in the period before the second pilgrimage to Rome. It is found in Asser, who states that Alfred "remained illiterate" (*illiteratus permansit*) to his 12th year or more, although he knew many Saxon poems by heart. By "illiterate" Asser undoubtedly means ignorant of Latin. Alfred could certainly read Anglo-Saxon before his 12th year, and the mother who, according to the story, promised a book of Anglo-Saxon poems to that one of her sons who first learned to read it to her, was without question Alfred's own mother, Osburh. It was not until after his accession that Alfred acquired a knowledge of Latin. Asser states that at Alfred's marriage festivities, in 868, he was attacked by a grievous illness which afflicted him for 20 years or longer. This story has obviously been exaggerated for hagiological purposes, although it probably has some foundation in the fact that Alfred was never in robust health.

Alfred first appears in public life in the year 866, as the assistant of his brother Æthelred in repelling the attacks of the Danes. In the midst of these Danish wars Alfred succeeded to the throne, nine general engagements being fought in this year. Alfred's own wars with the Danes centre in two great campaigns. As result of the first the Danes, in 878, promised to leave Wessex and their King, Guthrun, received Christian baptism. It was in this campaign that Alfred retreated to Æthelney in the fens of Somerset. Later tradition has added many unauthentic details to this episode, notably the story of the cakes and that of Alfred's playing as a disguised harper in the camp of the Danes. After 14 years of comparative peace the Danes returned to the attack. In the meantime, however, Alfred had strengthened his army and his defenses. At one brilliant engagement after another the Danes were defeated, and in 897 they fled into East Anglia and Northumbria and over sea into France. For the remaining years of Alfred's life, Wessex was at peace. The 'Chronicle' says, in recording Alfred's death, that he was king over all the English people except that part which was under the power of the Danes. But practically all England north of the Thames was in the Danelagh, and Alfred's authority extended only over Wessex and a part of Mercia. In saving Wessex, however, Alfred had saved England for the English people; for it was from Wessex as a centre that his successors began the task of reconquering England from the Danes.

In his years of peace Alfred was engaged in strengthening and organizing his army, in systematizing the government of the country and in laying those plans for advancing the intellectual interest of his people which made him so much more than merely the soldier. Unable to find teachers in England, Alfred brought scholars from abroad, and with their aid planned to have translated into English all those Latin books which he thought it most needful that his people should know. Alfred himself bore the greater part of this burden. His first translation was one of Pope Gregory's 'Pastoral Care,' made about 894. This was followed by the 'Universal History' of Orosius, and Bede's 'Ecclesiastical History,' though there is some question whether or not this latter work proceeded directly from the hand of Alfred. These were followed by his interesting version of Boethius' 'Consolation of Philosophy.' His last work was a translation and adaptation of writings of Augustine and Gregory. Other undertakings undoubtedly due to Alfred's influence are a translation of Gregory's 'Dialogues' (the preface of which was written by Alfred), the 'Anglo-Saxon Chronicle' (see ENGLISH CHRONICLES), and a translation of the Psalter. Popular tradition has ascribed a number of other works to Alfred which belong to much later periods. Asser refers to Alfred's 'Handbook,' a commonplace book or anthology, but this work is no longer extant. Historians agree in placing a high estimate on the character and achievements of Alfred. Freeman ('Norman Conquest,' I, 49) calls him "the most perfect character in history"; Ranke ('Weltgeschichte,' VI, II, 46) declares him to be "one of the greatest figures in the history of the world." It should be borne in mind, however, that it is not the magnitude of Alfred's military achievements, nor the extent of the country which he governed, that lift him into the ranks of the world's great men, but the beauty and moral grandeur of his character. In him were combined the virtues of the scholar and the patriot, the efficiency of the man of affairs with the wisdom of the philosopher and the piety of the true Christian. His character, public and private, is without a stain, and his whole life was one of enlightened and magnanimous service to his country.

Bibliography.— The primary sources of information concerning Alfred are Asser's 'Life of King Alfred' (ed. W. H. Stevenson, Oxford 1904); the 'Chronicle' (ed. Earle and Plummer, Oxford 1892–99); and the translations from Gregory, Bede and Boethius, texts of which are contained in Grein-Wülker, 'Bibliothek der angelsächsischen Prosa.' Numerous modern lives of Alfred have been written, the best being that by Plummer (Oxford 1902).

GEORGE P. KRAPP,
Instructor in English, Columbia University.

ALFRED, or ALUREDUS, OF BEVERLEY, ch onicler: flourished 1143. His 'Nine Books of Annals or History of the British

Kingdoms to 1129' is largely devoted to the fabulous history of Britain. It is of no use to the historical student, as it adds nothing to what is found in earlier authorities. The best manuscript of the work is among the Hengwet MSS., and has never been printed. Hearn printed an inferior Bodleian MS. in 1716.

ALFRED, N. Y., a village in Allegany County, on the Erie Railroad, 12 miles from Hornell and 341 miles west of New York city. It is noted as being the seat of Alfred University, a coeducational (non-sectarian) institution, organized in 1836 as a school, incorporated as a university in 1857. Professors and instructors in 1915, 42; students, 336; volumes in the library, 28,822; graduates, 1,063; productive funds, $412,000; total income, $100,000. There is a fine new Carnegie library valued at $30,000 and a university bank. Alfred is also the seat of the New York State School of Agriculture; New York State School of Ceramics, the Alfred Theological Seminary and the Alfred High School. The value of taxable property is $214,262. Pop. (1916) 750.

ALGÆ, ăl'jē, a term popularly restricted to marine cryptogamous plants or seaweeds, but which may be generally defined as comprehending all aquatic flowerless plants, whether growing in fresh or salt water, belonging to the group Thallophytes. The only absolute distinction between the Algæ and the remaining Thallophytes or Fungi is that the former contain chlorophyll, while the latter do not. The higher forms have stems bearing leaf-like expansions, and they are often attached to rocks by roots. A stem is most frequently absent. The plants are nourished through their whole surface by the medium in which they live. They vary in size from the microscopic diatoms to forms whose stems resemble those of forest trees and whose fronds rival the leaves of the palm. They are entirely composed of cellular tissue and many are edible and nutritious, as carrageen or Irish moss, dulse, etc. Kelp, iodine and bromide are products of various species. They are beginning to be used in the United States in the production of commercial fertilizers. Four groups are commonly distinguished: The blue-green algæ (*Cyanophyceæ*), green algæ (*Chlorophyceæ*), brown algæ (*Phæophyceæ*) and red algæ (*Rhodophyceæ*).

ALGARDI, ąl-gär'dē, **Alessandro,** one of the chief Italian sculptors of the 17th century: b. 1602; d. 1654. He lived and worked chiefly at Rome; executed the tomb of Leo XI in St. Peter's, and a marble relief with life-size figures over the altar of St. Leo there.

ALGAROTTI, Francesco, ăl'ga-rŏt'tē, frăn-chĕs'kō, COUNT, Italian author: b. Venice, 12 Dec. 1712; d. Pisa, 3 March 1764. His 'Plurality of Worlds' (1733), a popular exposition for ladies of Newton's philosophy, established his fame. Till 1739 he lived much in France and became intimate with Voltaire. The study of French literature and contact with its leading representatives exercised a marked influence on his style. His contemporaries greatly respected his art judgments and his 'Essays on the Fine Arts,' in Italian (Germ. tr. 1760), show keen discernment. Frederick the Great held him in high regard, created him count, and ordered a monument built to his memory in Pisa. The best edition of his works is in 17 volumes, Venice, 1791–94.

ALGAROVILLA, ăl'gą-rō-vĕl'yą the seed-pods of one or two South American trees (genus *Prosopis*), valuable as containing much tannin.

ALGARVE, or **FARO,** Portugal, a maritime province extending across the southern coast of the kingdom, bounded north by the province of Alemtejo, east by the Spanish province of Huelva, south and west by the Atlantic Ocean. It has a mountainous surface, with some fertile tracts, in which excellent oil, wine, figs and almonds are produced, and a coast indented with good bays and harbors. Its tunny and sardine fisheries are productive. Faro (pop. 12,000) is its capital. Area, 1,937 square miles. Pop. 274,156.

ALGAZZALI, ąl'gă-zä'lē, or **ALGHAZZÂLÎ, Abu Hamed Mohammed,** Arabian philosopher, Persian by birth: b. Tûs in Khorasan in 1058 or 1059; d. 1111. He first taught theology at Bagdad but left his chair and traveled in Syria, and lived for some time in Damascus, after which he returned to Persia and resumed teaching. The details of his life given by biographers are numerous but contradictory. He was one of the most prolific of the Arabian authors. One of his writings, called the 'Destruction of the Philosophers,' was answered by Averroes in a book entitled the 'Destruction of the Destruction.' He also wrote several moral treatises. Algazzali, as a disciple of the Sufis, was an opponent of the prevailing Aristotelian philosophy of the day and predisposed to the mystical dogmas of emanation, to which, after a keen and critical study of philosophy, he entirely resigned himself. Consult Dugat's 'Histoire des Philosophes et des Théologiens Musulmans' (Paris 1878).

ALGEBRA, Definitions and Fundamental Concepts. The word "algebra" is occasionally used with the same meaning as "mathematical discipline," in the sense of a body of mathematical entities which obey a given set of laws or formulæ. Accordingly we speak of the algebra of logic, the algebra of quaternions, the algebra of relations, the algebra of groups and so on indefinitely. The word is often used to cover those systems only whose formal structure is of a certain type. In this article we shall consider algebra in a still narrower sense — in fact in that sense in which the term is used in the high-school books of our childhood. That is, we shall consider the special algebra of ordinary complex numbers and the various simpler algebras of real numbers, of rational numbers and of integers, through which we pass in reaching the algebra of ordinary complex numbers.

Mathematics has been defined by Benjamin Pierce as that science which draws necessary conclusions. Logic, however, is not only a science which draws necessary conclusions, but is in fact the science of the method in which necessary conclusions may be drawn. The relation between logic and mathematics is thus peculiarly intimate and in fact the present view of the matter is that deductive logic is simply that part of mathematics which possesses the least limited hypotheses. We shall therefore search for the basis of algebra among such

logical entities as classes, properties, relations, etc., and shall see how the entire complicated fabric of algebra can be woven from these simple threads.

Assemblages.— We wish to exhibit how the algebra which is familiar to the schoolboy has its roots in the much simpler algorithm which will be found treated *in extenso* under the heads LOGIC, SYMBOLIC and ASSEMBLAGES, GENERAL THEORY OF. Here it is sufficient for us to call attention to one or two of the simpler aspects of this important theory. Though many difficult and fascinating paradoxes have been found underlying this simple assumption, we shall take it for granted that the things which enter into our daily life — "Shoes and ships and sealing-wax and cabbages and kings" — can be arranged in assemblages or classes in such a manner that a class is uniquely determined by the specification of all its members. These classes we shall represent by small Greek characters, and their members by small Roman letters.

Simple Properties of Assemblages.— One of the most obvious of these is that of containing members. Strange to say, this is not common to all assemblages. It is conspicuously absent in the assemblage of round squares, the assemblage of purple cows, etc. Another paradox about assemblages is that an assemblage of one member is a different thing from that member. The ink-bottle now in front of me may be the only one of its sort, but it is not the sort of ink-bottle of which it is the sole representative. In the symbolism which we shall use, the assemblage of all purple cows shall be represented by the symbol Λ, and if x is my ink-bottle, and is the only one of its sort, the assemblage of all the ink-bottles of the sort shall be called $\iota' x$. This is the symbolism of A. N. Whitehead and Bertrand Russell, the most recent writers on this subject as a whole.

Every two classes determine several new classes. If α stands for lawyers and β for congressmen, there are classes determined by α and β, one of which is made up of all the lawyers in Congress, the other of those who either sit in Congress or practice the law, or possibly carry on both pursuits. The first class we shall indicate by $\alpha \cap \beta$, the second by $\alpha \cup \beta$. It is clear that this use of $\cap$ and $\cup$ can be extended to any two classes whatsoever.

Similarity.— In a properly equipped army, every private has at least one gun issued to him. Let us suppose that work at the arsenals has ceased, and that every gun has been issued to some private. It is clear that the class of guns and that of privates will stand in a peculiarly intimate mutual relation — that of one — one correspondence or *similarity*. We may express the same fact by the statement that there are as many guns as soldiers. Observe that this identity in number is defined prior to and independently of number itself.

Cardinal Number.— The cardinal number, then, of an assemblage α is something that is common to all the assemblages similar to α, or as we shall say, since classes are more amenable to mathematical treatment than properties, the class of all assemblages similar to α. We shall represent cardinal numbers by the letters λ, μ, ν, o, π, ρ, and the cardinal number of the assemblage α by the symbol $Nc'\alpha$. It may be shown that our ordinary 0 is $\iota' \Lambda$, and that 1 is $Nc' \iota' x$, or the class of all the classes $\iota' x$.

Finite and Infinite Cardinals.— It is not universally true that the whole is greater than any of its parts. A picture one inch square may be enlarged to be two inches square. Each point of the two-inch picture, if the enlargement be accurate, represents uniquely a point of the one-inch picture, and vice versa, yet the one-inch picture can be laid down on one of the corners of the two-inch picture. Obviously, therefore, there are as many points in one of the four quarters of a picture or a square plane area as in the entire picture or area. Again, there is a first, a second, ..., an n-th odd number, so that it is possible by continuing this process indefinitely to assign every odd number to an integer and every integer to an odd number, yet the odd numbers form only a part of the integers. Here are instances of assemblages no greater than their own parts. Inspection will show that no aggregate containing a number of terms which can be expressed in the Arabic system of numeration can be of this type, for such aggregates are always reduced in number of terms when some are removed. The precise nature of these assemblages which can be enumerated by one of the ordinary numerals of the Arabic system will be discussed in a later paragraph. Here we call attention to the fact that it has not been demonstrated that all assemblages are either similar to one of their own parts or finite in the ordinary, every-day sense of having one of the natural numbers as their cardinal number. All apparent proofs of this depend on Zermelo's axiom (see ASSEMBLAGES, GENERAL THEORY OF). However, no assemblages such as we should ordinarily call finite are similar to their own proper parts, so that assemblages of the latter sort and their cardinal numbers are properly called infinite.

Greater and Less Among Cardinal Numbers.— λ is said to be greater than μ if λ is the cardinal number of some class α which contains a part β of which μ is the cardinal number, and if the converse relation does not hold. It is clearly impossible for λ to be greater than μ and for μ to be simultaneously greater than λ. That of any two cardinals one is the greater has not yet been demonstrated in general, though its proof for the natural numbers is easy. Thus while the natural numbers form a series, the infinites may constitute a tree or an anastomosing network. Here again Zermelo's axiom underlies all the earlier work on the subject.

Addition.— Consider the two numbers λ and μ. Let λ be the cardinal number of the assemblage α and μ that of β. Suppose that α and β have no member in common: that is, that $\alpha \cap \beta$ is Λ. It can then be shown that the cardinal number of $\alpha \cup \beta$ is independent of the particular value of α and of β chosen. Expressed in terms of λ and μ, $Nc' (\alpha \mu \beta)$ is written $\lambda + \mu$, and is called the sum of λ and μ. As cabbages and kings are the same as kings and cabbages — as $\alpha \cup \beta$ is identically $\beta \cup \alpha$ — it follows that $\lambda + \mu = \mu + \lambda$, or in other words that the operation of addition, when performed on any two cardinal numbers, finite or infinite, is commutative. In a similar way it may be shown that $\lambda + (\mu + \nu) = (\lambda + \mu) + \nu$, or that addition is always associative.

The Natural Numbers.— The "natural numbers" or "numbers that can be expressed in the Arabic notation" have already been mentioned. The best definition of these has been given by A. N. Whitehead and B. Russell, to the effect that the natural numbers are those which are amenable to the method of mathematical induction. That is, the natural numbers are those which possess every property which 1 possesses, which, when it is possessed by λ will also belong to $\lambda + 1$, where $+$ and 1 are used in the senses already defined. In other words, *the validity of the method of mathematical induction as applied to the natural numbers rests neither on an axiom nor on a theorem, but on the definition of the natural numbers.*

Multiplication.— Given two assemblages α and β, we can derive from them the assemblage of all the ordered pairs of entities the first member of which is an α while the second is β. For example, given a class of Christian names and a class of surnames, we can construct therefrom a class of all complete names of two parts, such that the Christian name is to be found among the given Christian names, while the surname is to be found among the given surnames. It is clearly in harmony with our normal use of terms to say that if there are μ Christian names and ν surnames in the two sets respectively, there are $\mu \times \nu$ complete names in the derived set. We shall generalize this and make it our *definition* of multiplication: $\mu \times \nu$, the product of μ and ν, is the number of couples formed by first selecting a term from a class of μ members and then selecting a term taken from a class of ν members. On the basis of the definition alone, the associative and commutative laws may be shown to hold of multiplication among any numbers, finite or infinite. Furthermore, the distributive law for multiplication with respect to addition — the law that $\mu \times (\nu + \pi) = (\mu \times \nu) + (\mu \times \pi)$ — is easy of universal proof in the algebra we have established.

Involution.— In ordinary algebra we find that there are μ^ν ways of forming classes by picking out one term from each of ν mutually exclusive assemblages of μ terms each. As this process may be applied to all assemblages whether finite or infinite, we make it the basis for our *definition* of involution. The ordinary laws of involution — that $\mu^{\nu + \pi} = \mu^\nu \times \mu^\pi$, that $\mu^{\nu \times \pi} = (\mu^\nu)^\pi$, and that $(\mu \times \nu)^\pi = \mu^\pi \times \nu^\pi$ — follow readily for all the numbers in our algebra.

Extension of the Number-Concept.— If we limit our discussion to what we have called the natural numbers, the system which we have obtained has identically the same algorithm as the algebra of our high-school days, in so far as we limit its application to the positive integers and 0. This system is called *Number-Theory* (see NUMBERS, THEORY OF). Now, number-theory is famous alike for the difficulty and the lack of generality of its methods and for its very slight practical value, so that a more regular and a more useful algebra becomes a desideratum. We want to be able to solve the equations $x+5=3$, $2x=7$, $x^2 - 2 = 0$, and $x^2 + 2 = 0$, all of which lack a solution of the algebra so far at our disposal. Be it noticed, the mere fact that these equations are insoluble within the present system does not permit us to assign to them arbitrary solutions; there is no more justification for saying that $x + 5 = 3$ "must have" a solution than there would be for saying that there "must be" an even prime greater than two. The absence of a solution to a problem is never a sufficient excuse for building that solution out of whole cloth. Our search for a more complete algebra must consequently take the form of a hunt for systems that actually do obey more universal laws than those of the signless integers, rather than that of filling out the system of the signless integers by the haphazard introduction of heterogeneous material.

Integers with Sign.— Here the problem is that of finding a system in which such equations as $x + 3 = 2$ are soluble. When we have once defined addition, the definition of subtraction follows without any further ado: $\mu - \nu$ is defined as that number which when added to ν gives μ.* $\mu + \nu$ and $\mu - \nu$ may be regarded as the results of performing on μ the operations of adding or subtracting ν. Let us call these operations $+\nu$ and $-\nu$, respectively. We shall define the sum of two operations of this sort as the operation consisting in their consecutive application. The word "sum" will here have a significance different from that which it possesses with reference to μ and ν. Its use, however, is natural, for the adding of numerical "steps" is closely analogous to the process whereby we add, say, two linear steps or lengths by the repeated application of a yardstick. Furthermore, when only entities of the form $+\mu$ are considered, the formal properties of the new summation will be the same as those of the old. When operations of the form $-\mu$ are admitted, our new additions will have all the properties we are accustomed to associate with addition among integers with sign, among which are the properties of associativity and commutativity. Similarly, if we define $(+\mu)\ (+\nu)$ and $(-\mu)\ (-\nu)$ as $+(\mu \times \nu)$, and $(+\mu)\ (-\nu)$ $(-\mu)\ (+\nu)$ as $-(\mu \times \nu)$, we shall find that the multiplication so defined will have the same properties intrinsically and with respect to addition that we should naturally expect multiplication to possess in the universe of integers with sign. Among these are the "laws" of associativity, commutativity and distributivity. Consequently, putting all things together, there is no reason why we should not call our $+\mu$'s and $-\mu$'s positive and negative integers, respectively, provided $\nu \neq 0$. In this system, we shall find that every equation of the form $x + a = b$ will be satisfied by some value of x. It is noteworthy that the system of integers for which this is true does not contain any of the integers of previous paragraphs, so that a positive integer turns out to differ from the corresponding signless or absolute integer.[1]

* This definition holds for all the uses of subtraction. Likewise, $x + y$ is that number which multiplied by y gives x

[1] It is the custom of mathematicians to call several things by a single name, if only they have analogous formal properties, so that we shall meet with entities called absolute integers among fractions, real numbers, and even among complex numbers.

Fractions or Rational Numbers.— Equations such as $3x=2$ are rendered soluble in a way quite analogous to the procedure of the last paragraph. Let m and n be any two positive or negative integers. We shall define $\frac{m}{n}$ as the relation which subsists between any two integers p and q if $mq=np$. We shall define $\frac{m}{n}+\frac{p}{q}$ as $\frac{mq+np}{nq}$, and $\frac{m}{n}\cdot\frac{p}{q}$ as $\frac{m.p}{n.q}$. We shall say that $\frac{m}{n}>\frac{p}{q}$ if n, q, and $mq-np$ are positive. When this has been done, it is demonstrable that the formal laws of associativity, commutativity and distributivity hold in the proper manner for addition and multiplication, that every equation of the form $ax=b$ has a solution when the entities concerned are expressions such as $\frac{m}{n}$, or as they are called, *fractions* or *rational numbers*, and that the relation $>$ determines an order among the fractions such that (a) we never have $x>x$; (b) if $x>y$ and $y>z$, then $x>z$; (c) if x and y are two distinct fractions, either $x>y$ or $y>x$. This latter set of facts is expressed by the statement that the fractions arranged in order of magnitude form a series. Be it noticed that though the fraction x may be taken to *represent* the integer x and is usually expressed by the symbol x, it is altogether distinct from that integer.

Real Numbers.— The system just developed is very rich in numbers. In fact, it can be proved that no matter how near any two fractions are to one another, there is a fraction lying between them in magnitude. Nevertheless, the series of fractions is everywhere full of gaps which prevent some of the very simplest equations from having solutions within it. For example, it can be shown that $x^2=2$ has no fractional or rational solution. If it had such a solution, it would necessarily be of the form $\frac{m}{n}$. m and n can be so chosen as to have no factor other than ± 1 in common. Therefore, we can so choose m and n that at least one of them will be odd, if any values whatever exist for m and n. Now, by hypothesis, $\left(\frac{m}{n}\right)^2=2$, or $m^2=2n^2$, and m is consequently even. If m is even, it is of the form $2k$. We thus get $4k^2=2n^2$, or $n^2=2k^2$, whereby n is shown to be even, so that our previous hypothesis is contradicted.

Though 2 has no rational square root, there are numbers whose squares exceed 2 by as little as we please, and numbers whose squares fall short of 2 by as little as we please. The approximate values we obtain in extracting the square root of 2 constitute a family of numbers which exemplifies this property: $2-1^2=1$, $2-1.4^2=.04$, $2-1.41^2=.0119$, $2-1.414^2=.009,064$ and so on indefinitely, while $2^2-2=2$, $1.5^2-2=.25$, $1.42^2-2=.0168$, $1.415^2-2=.002,625$, and so *ad infinitum*. That is, the process which we call extracting the square root of 2 consists in finding sequences of pairs of numbers whose squares bracket 2 by intervals which decrease beyond any assignable degree of minuteness. To put it crudely, we mark the place where the square root of 2 ought to be by a definite dividing-line in the scale of rationals between those whose squares fall short of 2 and those whose squares exceed 2.

These dividing-lines between the numbers that are larger than a given standard and those that are not have been termed by Dedekind *cuts*. Some of these cuts are immediately bounded above or below by a rational number, as for instance the cut which separates all numbers less than 3 from 3 and greater numbers. Others, such as the cut discussed in the last paragraph, have not this property.

By considering only those cuts which do not immediately follow a rational number, we obtain one cut and one only corresponding to each rational number, and a cut, to put it crudely, where a number ought to be, but isn't. For instance, if we take our cuts as a larger system of numbers, we shall find that there will be a cut which we might call the square root of 2. If we define the sum of the two cuts C_1 and C_2 as the cut which divides all the sums of fractions on the lower side of C_1 with fractions on the lower side of C_2 from all other fractions, and if we define C_1C_2 as the cut dividing all products of fractions on the side of C_1 more remote from O with fractions on the side of C_2 more remote from O from all other fractions, we shall be able to prove both that all the convenient laws of addition and multiplication are satisfied and also that there will be no lacunæ in our system such as that which prevented $x^2=2$ from being soluble in the universe of rational numbers. If we define the order of magnitude of our cuts in the natural manner, making one cut precede another if the second cut contains on its lower side fractions larger than any on the lower side of the first, we shall not only find that this order is a series, and a series between any two of whose members there lies a third, but also that every cut in this series is bounded on one side or the other by one of the terms of the series. These properties go to make up what is known to mathematicians as *continuity*,* and the ordinary properties which we have learned to attribute to the number system of real algebra are those that belong to continuous series. Therefore, taking all these considerations together, we can define the real numbers of ordinary algebra as the cuts which we have just discussed.

Complex Numbers.— Even in the system of real numbers we meet with equations that have no solution. While $x^2-2=0$ has real roots, $x^2+2=0$ is satisfied by no real value of x. However, there is a system easily obtained from that of the real numbers in which this equation and many like it are soluble. Let us consider a system made up of *ordered pairs* of real numbers, such as (a,b). Let us define $(a,b)+(c,d)$ as $(a+c,\ b+d)$ and $(a,b).(c,d)$ as $(ac-bd,\ ad+bc)$. It will be found that the usual laws of commutativity, associativity and distributivity for addition and multiplication will be fulfilled in this system, and that the ordeded pairs of the form $(a,\ O)$ will have the same formal properties among themselves as the real numbers a. Further-

*In Cantor's definition of continuity, an additional condition appears, which is also satisfied by the series of cuts in question.

more the equation $(0,\sqrt{2}).(0,\sqrt{2})=(-2,0)$ is valid, so that the analogue of -2 will have a square root in this system, and $x^2+2=0$ will be soluble, but it is still further demonstrable that if we define x^n as $\underbrace{x.x.x...x}_{n.\text{ times}}$, every equation of the form $a_0x^n + a_1x^{n-1} + a_2x^{n-2} + a_3x^{n-3} + \ldots\ldots + a_{n-1}x + a_n = 0$ will have solution in the algebra of number-couples. The couple (a,b) is usually written $a + ib$, and the theorem just discussed, to the effect that every equation of the form given (called an *algebraic equation*) has a solution in the algebra of complex numbers is known as the *Fundamental Theorem of Algebra*. It is due to Gauss.

It has long been established that there is no algebra which includes complex algebra in the way in which complex algebra includes real algebra wherein the operations of addition and multiplication continue to obey their familiar laws. Complex algebra, then, cannot be extended, and owing to the fundamental theorem of algebra it need not be extended, so that it is the algebra *par excellence* for the mathematician.

For a further discussion of the real and complex number-systems see the articles on REAL VARIABLE, THEORY OF THE, and COMPLEX VARIABLE, THEORY OF THE, respectively.

Exponents.— In the last paragraph we have defined x^n in the case where n is an integer. This obeys all the laws laid down in the paragraph on involution. These laws require that if any use of fractional exponents is to conform to them, $\left(x^{\frac{m}{n}}\right)^n$ must equal x^m.[1] It may be demonstrated that so long as we confine ourselves to positive values of the roots of positive numbers, if $x^{\frac{m}{n}}$ be defined as the nth root of x^m, all the laws of exponents will be obeyed. It can likewise be shown that the definition of x^{-n} as $\frac{1}{x^n}$ will yield consistent results.

These are accordingly the definitions of fractional exponents actually used. When other than positive roots of positive quantities are considered, the matter is not quite so simple. If n is not rational, x^n is defined as the limit of x^m where m is a variable that approaches n through rational values.

The Method of Postulates.— The method whereby we have derived algebra from the entities and truths of logic is not the only one that has been applied in establishing this subject on a logical foundation. The *method of postulates* which has been employed so effectively by Veblen and Huntington in many branches of mathematics has been used by Huntington for the study of algebra. This method consists in reducing the theorems of algebra to the consequences of a few simple formal laws such as the laws of associativity and of commutativity for addition and multiplication and the law of the distributivity of multiplication with respect to addition and others of the same sort. When this is done, algebra is considered not as the study of a set of specifically numerical entities but as the study of any entities you please that obey its postulates. Rational, real, and complex algebra each receive a complete and self-contained treatment according to this method. See POSTULATES, THEORY OF.

Bibliography.— The most thorough work on this subject is the 'Principia Mathematica' of A. N. Whitehead and B. A. W. Russell (Cambridge 1910–13). Whitehead's 'Introduction to Mathematics' (in the Home University Library series) is the best popular book. Consult also Huntington, E. V., 'A Complete Set of Postulates for the Theory of Absolute Continuous Magnitude' (Trans. Am. Mat. Soc., 1902), 'Complete sets of Postulates for the Theory of the Real Numbers' (ibid. 1904), and 'The Continuum' (Cambridge, Mass., 1917).

NORBERT WIENER.

Editorial Staff of The Americana.

ALGEBRA, Elementary.[1] **Terms, Expressions, Factors, etc.**—In Algebra numbers, real or complex, are commonly called *quantities*. Any lawful combination, however complicate, of number symbols represents a number or quantity, and is named algebraic *expression*, as 5, $3a$, $\sqrt{7}\left(a\frac{1}{2} - \sqrt[3]{x^2}\right)$, $\frac{(m-n)^{\frac{a}{b}}}{x-z\sqrt[4]{w}}$. The parts of an algebraic expression that are connected by the sign $+$ or $-$ are called *terms*. Two or more terms enclosed in *parentheses* ( ) or *brackets* [ ] or *braces* { } or written under a *vinculum* —— are treated as a whole; thus, $2-(4+6)=2-10$, $3\times\overline{7-5}=3\times 2$, $x-[y-\{z-(x-y-z)\}]=x-[y-\{z-(x-y+z)\}]=x-[y-\{z-x+y-z\}]=x-[y+x-y]=x-x=0$. An expression of more than one term is a *polynomial* or *multinomial*. Expressions of one, two, three terms are respectively *monomial, binomial, trinomial*; thus, $a-(b-c)$ is binomial, though its equivalent, $a-b+c$, is trinomial.

In the indicated product of two or more symbols, as $4abx$, any partial product is the *coefficient* of the complementary product. Thus 4 and abx are coefficients of each other, as are a and $4bx$, or x and $4ab$. An expression is *integral* with respect to given symbols if it may be expressed as a sum of products of positive integral powers of these symbols with one another and with coefficients which do not contain them. An expression is *fractional* with respect to given symbols if it is the quotient of two expressions which are integral in the symbols, but is not integral itself. An expression is called rational if it is fractional or integral, but irrational otherwise. An expression may be integral in some symbols and fractional in others, as in the case of $\frac{(x^2-y^2)w^{-4}}{z^3}$ which is integral in x and y, but fractional in w and z. Similarly $x+y^2-\sqrt[3]{z^2}$ is rational in y, but irrational in x and z. Any expression, in case it is rational and integral as to some symbol, as x, is said to be of degree n

[1] $\frac{m}{n}$ is defined as $m\div n$.

[1] For definitions of $x+y$, $x-y$, xy, $x\div y$, x^m, see article on ALGEBRA, DEFINITIONS AND FUNDAMENTAL CONCEPTS. $\frac{m}{n}$ is defined as $m\div n$, $\sqrt[m]{x}$ as $x^{\frac{1}{m}}$, and $\sqrt{x}$ as $\sqrt[2]{x}$.

in that symbol if its greatest exponent in any term is n; thus $a^3x^5+ba^3x^3-4xa^6+1$ is of degree 5 in x, of degree 6 in a, and of degree 1 in b. An expression rational and integral in two or more symbols is said to be of degree s in those symbols (together) if s is the largest sum of the exponents of those symbols in any term; thus $a^2b^3c-5a^2b^4c^3-7b^3c^3$ is of degree 9 in a, b, c (together). In general, each of two or more expressions is called a factor of their product. In this general sense, $a^{\frac{1}{2}}$ and $a^{\frac{1}{3}}$ are factors of a^1, and so, too, are $\frac{a^2}{b}$ and $\frac{b}{a}$. In a more restricted sense, the factors of an expression rational and integral as to some letter must themselves be rational and integral as to that letter; thus some factors of a^2b-a^3b are a, a^2, b, ab, a^2b, $1-a$, for division by any of these yields a quotient rational and integral as to a and b. In such cases, factors of lowest degree in any symbol are called simple factors (in that symbol). A factor of two or more expressions is called a *common factor* of them. The common factor of highest degree is called the *highest common factor* (*H.C.F.*); thus the *H.C.F.* of a^2b^3 and a^3b^5 is a^2b^3; of a^2-b^2 and $ac+bc$, it is $a+b$. Every expression is a *multiple* of its factors. A multiple of two or more expressions is called a *common multiple* of them; it is their *lowest common multiple* (*L.C.M.*) if it is the common multiple of lowest degree; thus, the *L.C.M.* of ab^2c^3 and a^2bc^2 is $a^2b^2c^3$; of $(x-a)(x-b)^2(x-c)^3$ and $(x-a)^4(x-b)(x-c)$ it is $(x-a)^4(x-b)^2(x-c)^3$. It is readily proved that the product of two expressions is equal to that of their *H.C.F.* and *L.C.M.* If E is any algebraic expression, then E^2, E^3, . . . , E^n are respectively the second, third, . . . , nth powers of E, and E is the *square, cube, . . . , nth* root respectively of E^2, E^3, . . . , E^n. In particular, E^2 and E^3 are the square and the cube of E. Thus ax^2 is the square root of a^3x^4, $\frac{a}{b}$ is the cube root of a^3b^{-3}, $x^{\frac{1}{2}}-y^{\frac{1}{2}}$ is the square root of $(x^{\frac{1}{2}}-y^{\frac{1}{2}})^2$, or $x+y-2x^{\frac{1}{2}}y^{\frac{1}{2}}$.

Ratio, Proportion, Variation.—The fraction $\frac{a}{b}$ is the *ratio* of a to b, often written $a:b$, of which a is *antecedent* and b is *consequent*. if $a=\frac{x}{y}$ and $b=\frac{z}{w}$, then $a:b=\frac{xw}{yz}$. A ratio is *commensurable* or *incommensurable* according as it is or is not a rational number; thus, 2:5 is commensurable, but $\sqrt{2}$:1, ratio of diagonal to side of square, is incommensurable. Plainly, ratio theory is fraction theory. It is easily proved that if $\frac{a}{b}=\frac{c}{d}=\frac{e}{f}=\ldots$, then $\frac{a+c+e+\ldots}{b+d+f+\ldots}=\frac{a}{b}$, unless $b+d+f+\ldots=0$. If $\frac{a}{b}=\frac{c}{d}$, a, b, c, and d, taken in order, are *in proportion*, often written $a:b::c:d$, or $a:b=c:d$, a and d being the *extremes* and b and c the *means*. In such case $ad=bc$, and conversely. If $a:b=b:c$, i.e., if $b^2=ac$, b is a *mean proportional* to a and c, and c is a *third proportional* to a and b. If $a:b=c:d$, then $a+b:b=c+d:d$, $a-b:b=c-d:d$, whence $a+b:a-b=c+d:c-d$; *i.e.*, a, b, c, d are in proportion by *composition*, by *division*, and by both. A quantity x varies *directly* as y, symbolically $x \propto y$, if the ratio of every two values of x is equal to the ratio of the corresponding y values. If $x \propto 1:y$, x varies *inversely* as y. If $y \propto yz$, x varies as y and z *jointly*. Examples: if x is distance traveled and y is rate, $x \propto y$; if x is volume of given mass of gas (at constant temperature) and y is pressure on it, $x \propto 1:y$ (Boyle's Law); if x is the area of triangle and y and z are base and altitude, $x \propto yz$. If $x \propto y$, $x=cy$, where c is some constant; if $x \propto 1:y$, $x=c:y$; if $x \propto yz$, $x=cyz$, if $x \propto y$ and $\propto 1:z$, $x=cy:z$; if $x \propto y$ and $y \propto z$, $x \propto z$, $x+y \propto z$, $x-y \propto z$, $\sqrt{xy} \propto z$; if $x \propto y$ and $z \propto w$, $xz \propto yw$; if $x \propto y$, $x^k \propto y^k$, k any exponent; if $x \propto y$ when z is constant, and $x \propto z$ when y is constant, then $x \propto yz$ when y and z both vary. It is seen that *variation* is a kind of generalized doctrine of proportion.

The Notion and Notation of Function.—A quantity which may take different values is a *variable*. Two variables so related that to a value of either there corresponds one or more values of the other are called functions of each other (see INFINITESIMAL CALCULUS). Any algebraic expression is a function of the symbols it involves, and conversely; for example, $2x^2+3$ is a function of x, as x is of $2x^2+3$. A function of a symbol as x is often denoted by the symbol $f(x)$ or $F(x)$ or $\phi(x)$ or the like and read f-function of x, and so on. If $f(x)=2x^3-4$, then $f(0)=-4$, $f(-1)=-2$, $f(a)=2a^3-4$, etc. The function symbol has reference to the *form* of the function, and in the same argument or discussion the same symbol may not be used for two different functions. Of great importance are the integral (entire) polynomials, of which the general form for a single variable x is $f_n(x)\equiv a_0x^n+a_1x^{n-1}+a_2x^{n-2}+\ldots+a_{n-1}x+a_n$. The coefficients $a_0, a_1 \ldots\ldots, a_n$ are regarded as arbitrary constants. Accordingly $f_1(x)\equiv a_0x+a_1$, said to be *linear* or of first degree; $f_2(x)\equiv a_0x^2+a_1x+a_2$, the general *quadratic* expression or expression of second degree; $f_3\equiv a_0x^3+\ldots+a_3$, the general *cubic*, $f_4(x)\equiv a_0x^4+\ldots a_4$ the general *biquadratic*, etc. The *general* expressions become *particular* or *special* on assigning specific (numerical) values to the (literal) coefficients. In any $f_n(x)$ any value may be given to x, the corresponding value of $f_n(x)$ is then determined. The inverse problem of determining all values of x for which $f_n(x)$ shall have a prescribed value is far more difficult. A value of x for which $f_n(x)$ is zero is said to cause $f_n(x)$ to *vanish*. To every expression $f_n(x)$ corresponds an equation, $f_n(x)=0$, of 1st, 2d, . . . , nth degree, according as $n=1, 2, \ldots, n$. The equation imposes a *condition* on x, restricting its variability, allowing it only such values as make $f_n(x)$ vanish. (The variable in an equation is called the *unknown quantity*). Any such value is a *root* of the equation. The equation $f_n(x)=0$ has n and only n roots (see THEORY OF EQUATIONS). To *solve* an equation is to find its roots. A linear equation $a_0x+a_1=0$ has one root, $\frac{-a_1}{a_0}$ and it may always be found by adding $-a_1$ to both *members* a_0x+a_1 and 0 and then dividing the sums by a_0. The result of the addition is the equation $a_0x=-a_1$. Obviously any term may be *transposed* from either member of an equation to the other if at the same time the *sign* of the

term be reversed. Presently we shall see how to solve *quadratic cubic* and *biquadratic* equations.

Factor and Remainder Theorems.— Obviously $f_n(x)$ may contain a factor of the form $x-a$; *e.g.*, $x-2$ is a factor of x^2-4. If $f_n(x)$ has $x-a$ for factor, then $f_n(x) \equiv (x-a)Q$, where Q is the quotient of $f_n(x)$ divided by $x-a$. Hence under the supposition $f_n(x)$ vanishes when a is put for x. The converse is the *factor theorem*: If $f_n(x)$ vanishes on replacing the variable x by a number a, then $x-a$ is a factor of $f_n(x)$. Proof: divide $f_n(x)$ by $x-a$ until the remainder R does not contain x. Then $f_n(x) \equiv (x-a)Q+R$; put a for x, then $f_n(a) \equiv (0-0)Q+R$, but $f_n(a)=0$; hence $R=0$; hence $f_n(x) \equiv (x-a)Q$. At the same time the *remainder theorem* is proved: Division of $f_n(x)$ by $x-a$ yields $f_n(a)$ for remainder. By the factor theorem it is seen that x^n-a^n is divisible by $x-a$, for on putting a for x, $x^n-a^n=a^n-a^n=0$. Put a for x in x^n+a^n; the result is not zero; hence $x-a$ is not a factor of x^n+a^n. If n is odd, $x+a$ is a factor of x^n+a^n for $(-a)^n+a^n=0$ for n odd.

The Quadratic Equation.— The general quadratic equation $ax^2+bx+c=0$ can be solved as follows: the roots of an equation are not altered by adding a constant to both members or by multiplying both by a constant. Dividing both members by a, then adding $\frac{b^2}{4a^2} - \frac{b^2}{4a^2}$ to the left member, we obtain

$$\left(x+\frac{b}{2a}\right)^2 - \left(\frac{b^2-4ac}{4a^2}\right) = 0; \text{ factoring,}$$

$$\left\{x+\frac{b}{2a}+\frac{1}{2a}\sqrt{b^2-4ac}\right\}\left\{x+\frac{b}{2a}-\frac{1}{2a}\sqrt{b^2-4ac}\right\}=0.$$

If the product of two or more integral factors is zero, one of them must be zero and the equation is *satisfied* if any one of them is zero. Hence the roots of the quadratic are the roots of the linear equations obtained by equating to zero the foregoing factors. The roots r_1 and r_2 are:

$$r_1=\frac{1}{2a}(-b+\sqrt{b^2-4ac}),\ r_2=\frac{1}{2a}(-b-\sqrt{b^2-4ac}).$$

Thus it is seen that every quadratic equation has two and but two roots. Their *sum* $r_1+r_2=-\frac{b}{a}$ and their product $r_1r_2=\frac{c}{a}$, a special case (see EQUATIONS, THEORY OF) of the law connecting the roots and coefficients in the general equation $f_n(x)=0$. If the coefficients are real, the roots are both imaginary when and only when the discriminant $b^2-4ac<0$, or negative. If $b^2-4ac=0$ the roots are equal; if b^2-4ac is a perfect square, they are rational.

The Cubic Equation, Cube Roots of Unity. — Let $x^3=1$, then $x^3-1=0$; factoring left member, $(x-1)(x^2+x+1)=0$. Hence the cube roots of unity are 1, $\omega_1=\frac{1}{2}(-1+\sqrt{-3})$, $\omega_2=\frac{1}{2}(-1-\sqrt{-3})$. ω_1 and ω_2 are imaginary (complex); $\omega_1^2=\omega_2$, $\omega_2^2=\omega_1$, $\omega_1^3=\omega_2^3=1$. Writing ω for ω_1, the cube roots of 1 are 1, ω, ω^2. Any number a has three cube roots, $\sqrt[3]{a}$, $\omega\sqrt[3]{a}$, $\omega^2\sqrt[3]{a}$; thus the cube roots of 8 are 2, $\omega 2$ and $\omega^2 2$. The general cubic may be written $x^3+ax^2+bx+c=0$. On putting $y-\frac{a}{3}$ for x, the cubic becomes

$$y^3+\left(b-\frac{a^2}{3}\right)y+\left(c-\frac{ab}{3}+\frac{2a^3}{27}\right)=0,$$

or $y^3+py+q=0$ lacking the second term and called the *reduced* cubic. It is sufficient to solve the reduced cubic, for the roots of the original are then found by the relation $x=y-\frac{a}{3}$.

Let $y=z-\frac{p}{3z}$, then $z^3+qz^3-\frac{p^3}{27}=0$. This is quadratic in z^3, *yielding* $z^3=-\frac{q}{2}\pm\sqrt{Q}$ (where $Q=\frac{q^2}{4}+\frac{p^3}{27}$), $z=\sqrt[3]{-\frac{q}{2}\pm\sqrt{Q}}$, $\omega\sqrt[3]{\ }$, $\omega^2\sqrt[3]{\ }$. From the fact that z has six values, it must not be inferred that y has six; for the two values z_1^3 and z_2^3 of z^3 are such that $z_1^3z_2^3=-\frac{p^3}{27}$; hence the six z-values, z_1, z_2, ωz_1, $\omega^2 z_2$, ωz_2, $\omega^2 z_1$, yield but *three* y-values, corresponding to the relations $z_1z_2=\omega z_1\cdot\omega^2 z_2=\omega^2 z_1\cdot\omega z_2=-\frac{p}{3}$. For example, $y_1=z_1-\frac{p}{3z_1}=z_2-\frac{p}{3z_2}=z_1+z_2$. If

$$z_1=\sqrt[3]{-\frac{q}{2}+\sqrt{Q}}, \text{ then } z_2=\sqrt[3]{-\frac{q}{2}-\sqrt{Q}},$$

and the y-values are:

$$y_1=\sqrt[3]{-\frac{q}{2}+\sqrt{Q}}+\sqrt[3]{-\frac{q}{2}-\sqrt{Q}},$$

$$y_2=\omega\sqrt[3]{-\frac{q}{2}+\sqrt{Q}}+\omega^2\sqrt[3]{-\frac{q}{2}-\sqrt{Q}},$$

$$y_3=\omega^2\sqrt[3]{-\frac{q}{2}+\sqrt{Q}}+\sqrt[3]{-\frac{q}{2}-\sqrt{Q}}.$$

It can be readily shown for real p and q that one of the y's is real and the other two are conjugate imaginaries if Q be $+$, that all are real and two are equal if $Q=0$, and that all are real and distinct if Q is $-$. The last case is called *irreducible* because the root formula, involving imaginaries, is *practically* valueless. In this case the roots may be found by help of the trigonometric functions (see TRIGONOMETRY) as follows: Let $Q=-r^2\sin^2\theta$, $-\frac{1}{2}q=r\cos\theta$, then $r=\sqrt{-p^3:27}$, $\cos\theta=-\frac{1}{2}q:\sqrt{-p^3:27}$. The value of θ may be found by trigonometric table. Hence

$$\sqrt[3]{-\tfrac{1}{2}q+\sqrt{Q}}=\sqrt[3]{r\cos\theta+ir\sin\theta}$$

$$=\sqrt[3]{r}\left\{\cos\tfrac{1}{3}(\theta+2k\pi)+i\sin\tfrac{1}{3}(\theta+2k\pi)\right\}$$

and

$$\sqrt[3]{-\tfrac{1}{2}q-\sqrt{Q}}$$

$$=\sqrt[3]{r}\left\{\cos\tfrac{1}{3}(\theta+2k\pi)-i\sin\tfrac{1}{3}(\theta+2k\pi),\right.$$

$k=0$, $\frac{1}{2}$, or 1. The y formulæ then give $y=2\sqrt[3]{r}\cos\frac{1}{3}(\theta+2k\pi)$,

The Biquadratic, or Quartic.— In general form this is $x^4+px^3+qx^2+rx+s=0$. The equivalent *reduced* quartic, $x^4+ax^2+bx+c=0$, is found by replacing x by $x-\frac{p}{4}$. To solve the reduced quartic, let $x=u+y+z$, then $x^4-2x^2(u^2+y^2+z^2)$

$= 8uyzx + (u^2+y^2+z^2)^2 - 4(u^2y^2 + y^2z^2 + (z^2u^2) = 0$; if this be identical with the reduced quartic, $a = -2(u^2+y^2+z^2)$, $b = -8uyz$, $c = (u^2+y^2+z^2)^2 - 4(u^2y^2+y^2z^2+z^2u^2)$. Owing to relations between the roots and coefficients of any equation (see EQUATIONS, THEORY OF), the roots of the *auxiliary* cubic $t^3 + \frac{a}{2}t^2 + \frac{a^2-4c}{16}t - \frac{b^2}{64} = 0$ are u^2, y^2, z^2. Denoting them by l, m, n, we have $x = \pm\sqrt{l} \pm \sqrt{m} \pm \sqrt{n}$, apparently eight values of x, but really only *four* because the product $uyz = -b$:8. If b is positive the values of x are $-\sqrt{l}-\sqrt{m}-\sqrt{n}$, $-\sqrt{l}+\sqrt{m}+\sqrt{n}$, $\sqrt{l}-\sqrt{m}+\sqrt{n}$, $\sqrt{l}+\sqrt{m}-\sqrt{n}$; if b is negative, they are the negatives of the former.

Historical and Critical Note.— As seen, the general equations of 4th and lower degrees are soluble by means of radicals or root extraction. It was naturally but incorrectly supposed that the same means would prove available in case of the general quintic and equations of higher degree, and one of the great problems of the 18th century was to solve the quintic in a manner analogous to that employed above for the quartic, cubic and quadratic. In 1770 Lagrange proved that the method was not adequate for that purpose, as it gave for *auxiliary* equation an essentially general one of *sixth* degree. By Abel, Wantzel and Galois (see EQUATIONS, GALOIS' THEORY OF.) it was shown to be impossible to solve by radicals any *general* equation of degree above 4. Subsequently Hermite proved that the roots of the general quintic are expressible in terms of elliptic functions. The quadratic, cubic and quartic are solvable by other methods than those given above, but all are essentially the same. The solution of the general quadratic was known to the Arabs in the 9th century. The solution of $x^3+px+q=0$ was discovered by Scipio Ferreo in the beginning of the 16th century. It was rediscovered a few years later by Tartaglia. The solution given above is known as Cardan's, but it is known that Cardan learned it from Tartaglia. Ferrari, a pupil of Cardan's, solved the quartic. The solution, given by Bombelli in his algebra (1579), is sometimes attributed to him. Descartes gave a different solution in 1637. The solution presented above is Euler's, having been found by him in 1770.

Higher Equations.— Although the *general* equations of the 5th and higher degrees are not solvable by radicals, many *particular* equations of such degrees are thus solvable; e.g., $x^5-1=0$ breaks up into two quartics, $x^4-1=0$, $x^4+1=0$. In works on the theory of equations (see EQUATIONS, THEORY OF) various methods, chief of which is Horner's, are given whereby the commensurable roots of any equation having numerical coefficients can be found and the incommensurable roots can be found to any required degree of approximation.

Simultaneous Equations.— The general linear equation in two variables or unknowns, as x and y, is $ax+by=c$. Solved for one of the variables, say x, in terms of the other, the equation becomes $x = \frac{c-by}{a}$. It is seen that x and y are functions of each other: to any value of either corresponds a value of the other. Any two corresponding values constitute a *pair satisfying* the equation. There are infinitely many such pairs satisfying a given equation of the kind in question, as many pairs as there are numbers. Obviously there are hosts of pairs not satisfying a given equation. All the pairs satisfying a given equation constitute a *system* of pairs. Two equations $a_1x + b_1y = c_1$, $a_2x + b_2y = c_2$ are different unless $a_1 : a_2 = b_1 : b_2 = c_1 : c_2$. Have the two systems determined by two different equations any pairs in the common? The answer is, *one* pair. It can be found as follows: Multiplying the former equation by b_2, the latter by $-b_1$, adding and solving for x, $x = (b_2c_1 - b_1c_2) : (a_1b_2 - a_2b_1)$; analogously, $y = (a_2c_1 - c_1a_2) : (a_1b_2 - a_2b_1)$. This and only this pair of values of x and y satisfies *both* equations. In combining the equations, x and y were regarded as the same in both. Two or more equations in two or more unknowns are called *simultaneous* when the unknowns are treated as representing the same numbers in all the equations. In the foregoing solution the x-equation was found by *eliminating* y *between* the given equations. The elimination was accomplished by *addition*. It might have been done otherwise, as by *comparison*, i.e., solving each equation for y and equating the y-values so obtained, or by *substitution*, i.e., solving one of the equations for y and substituting the y-value so found for y in the other equation. In any of these ways or by combinations of them one may find a triplet of values satisfying three arbitrary equations in three unknowns, x, y, z: eliminate, say z, between two of them and then between the remaining one and one of the others; so result two equations in x and y, to be handled as above. The method is obviously extensible to the case of n equations in n unknowns. In general, n linear equations in n unknowns are satisfied simultaneously by but a single set of values, but in special cases by no set or by more than one set. The latter happens only when the coefficients satisfy some special condition or conditions. Under certain conditions n or more equations in $n-1$ unknowns may be satisfied by the same set of value. Thus $ax + b = 0$ and $cx + d = 0$ have the same root when and only when $bc - ad = 0$; $a_1x + b_1y + c_1 = 0$, $a_2x + b_2y + c_2 = 0$, $a_3x + b_3y + c_3 = 0$, are simultaneously satisfied or are *consistent* when and only when $a_1b_2c_3 + a_2b_3c_1 + a_3b_1c_2 - a_3b_2c_1 - a_2b_1c_3 - a_1b_3c_2 = 0$. For the expression of such conditions, and the solution of sets of linear equations, by means of determinants, see the article DETERMINANTS and works therein cited.

Simultaneous equations involving the unknowns to degrees higher than the first may sometimes be solved. Consider, for example, the pair of equations: $ax + by + c = 0$, $dx^2 + ey^2 + fxy + gx + hy + k = 0$; from the former $y = -(c + ax) : a$; substituting that y-value for y in the second given equation, a quadratic in x is found; this gives two x-values; substituting these in the given linear equation, the two *corresponding* values of y are found. The corresponding values must be properly *paired*; thus the equations $3x + 4y - 5 = 0$ and $2x^2 - xy + y^2 - 22 = 0$ give $x = 3$ and $-109:53$, $y = -1$ and $148:53$; the proper pairing is $x = 3$, $y = -1$, and $x = -109:53$, $y = 148:53$; the equations are not satisfied by $x = 3$, $y = 148:53$, for example. Once more, the two quadratics $x^2 + 3xy = 28$,

$xy+4y^2=8$ give, on division (member by member) and clearing of fractions, $2(x^2+3xy)=7(xy+4y^2)$; whence $x=4y$ or $-7y:2$. For $x=4y$, the second given equation furnishes $4y^2+4y^2=8$ and $y=1$ or -1, whence $x=4$ or -4; using $x=-7y:2$ in like manner, one finds $y=+4$ or -4 and $x=-14$ or 14; in all four pairs of values corresponding thus: $x=4$, $y=1$; $x=-4$, $y=-1$; $x=14$, $y=-4$; $x=-14$, $y=4$. In general, an equation of mth degree and one of nth degree in two unknowns are both satisfied by mn pairs of numbers. The solution of such a pair involves, in general, the solution of an equation of degree mn.

Permutations and Combinations.— Any arrangement (in a row) of r things (regarded as belonging to a set of n things) is called a (straight) *permutation of the n things r at a time*. Two permutations are the same when and only when they consist of the same things in the same order. The number of different (possible) permutations of n things r at a time is often denoted by ${}_nP_r$. To find this number, think of *any* one of the ${}_nP_{r-1}$ permutations of n things $r-1$ at a time. There remain $n-r+1$ things. Put one of these after the things of the given permutation. There so results a permutation of the n things r at a time. It readily follows that ${}_nP_r={}_nP_{r-1}.(n-r+1)$, ${}_nP_{r-1}={}_nP_{r-2}.(n-r+2)$, ..., ${}_nP_2={}_nP_1.(n-1)$, ${}_nP_1=n$. Multiplying these equations member by member, it is found that ${}_nP_r=n(n-1)\ldots(n-r+1)$. If $r=n$, ${}_nP_n=n!$, where $n!$ (or $\lfloor\underline{n}$) means $1\times2\times3\times\ldots\times n$ and is read *factorial n*. It can be readily proved that the number P of permutations of n things $(a, b, c, \ldots)$ n at a time, p of the things being a's, q of them b's, ..., is $P=\frac{n!}{p!\,q!\ldots}$. If the *order* in a permutation of n things r at a time be disregarded, the result is a *combination* of n things r at a time. Two combinations are the same if they consist of the same elements. A common symbol for the number of combinations of n things r at a time is ${}_nC_r$. By permuting the r things of a combination in every way, $r!$ permutations arise. It follows that ${}_nC_r.r!={}_nP_r$, whence ${}_nC_r={}_nP_r:r!$ Since, on taking r things from n things, there remain $n-r$ things, it is seen that ${}_nC_r={}_nC_{n-r}$.

Arithmetical Progression.—An *A.P.* is a series of numbers such that the difference between any two adjacent terms is the same as that between any other two adjacent terms. The general *A.P.* is: a, $a+d$, $a+2d, \ldots$, $a+\overline{n-1}\,d$. The theory involves five elements: the common difference, d; the first term, a; the last, l; the number of terms, n; and the sum of the terms, s. Given any three of the elements, the remaining two can be found. Since ${}_5C_3=10$, there are but 20 problems to solve, giving rise to as many formulæ. The formula for l in terms of a, d and n obviously is $l=a+\overline{n-1}\,d$. To find s in terms of a, l and n, let $s=a+(a+d)+(a+2d)+\ldots+(l-2d)+(l-d)+l$; then $s=l+(l-d)+(l-2d)+\ldots+(a-2d)+(a-d)+a$; adding, $2s=n(a+l)$, whence $s=\frac{n}{2}(a+l)$. The remaining 18 formulæ, completely exhausting the subject, are:

$$l=-\tfrac{1}{2}d+\sqrt{2ds+(a-\tfrac{1}{2}d)^2};\quad l=\frac{2s}{n}-a;\quad l=\frac{s}{n}+\frac{(n-1)d}{2};\quad s=\tfrac{1}{2}n(2a+\overline{n-1}\,d);\quad s=\frac{l+a}{2}+\frac{l^2-a^2}{2d};\quad s=\tfrac{1}{2}n(2l-\overline{n-1}\,d);\quad a=l-\overline{n-1}\,d;\quad a=\frac{s}{n}-\tfrac{1}{2}(n-1)d;\quad a=\tfrac{1}{2}d\pm\sqrt{(l+\tfrac{1}{2}d)^2-2ds};\quad a=\frac{2s}{n}-l;\quad d=(l-a)+(n-1);\quad d=2(s-an)+n(n-1);\quad d=(l^2-a^2)+(2s-l-a);\quad d=2(nl-s)+n(n-1);\quad n=1+(l-a)+d;\quad n=(d-2a\pm\sqrt{(2a-d)^2+8ds})+2d;\quad n=2s+(a+l);\quad n=(2l+d\pm\sqrt{(2l+d)^2-8ds})+2d.$$

Geometric Progression.—A *G.P.* is a series of numbers such that the ratio of any one to the next is equal to the ratio of any other one to its next. Accordingly, the general form of a *G.P.* is: a, ar, $ar^2, \ldots, ar^{n-1}$. Again, there are five elements to be considered: the first term, a; the last, l; the ratio, r; the number of terms, n; and the sum of the terms, s. In terms of any three of the five elements, either of the remaining elements can be expressed. Accordingly the theory of the *G.P.* involves the solution of but 20 problems. Most important of these are the problems, to express l in terms of a, r and n, and to express s in terms of a, r and n. It is plain that l, or the nth term, is $l=ar^{n-1}$. To find s, let $s=a+ar+\ldots+ar^{n-2}+ar^{n-1}$; thence $rs=ar+ar^2+\ldots+ar^{n-1}+ar^n$; substracting, and dividing by $1-x$, it is found that $s=\frac{a(1-r^n)}{1-r}=\frac{a-rl}{1-r}$. The remaining 18 formulæ are easily obtained. If r be numerically less than 1, the *G.P.* is said to be a *decreasing G.P.*; otherwise, not. In case of a decreasing *G.P.*, it is possible to *sum the series to infinity*, a phrase requiring explanation. An endless series, $a_1, a_2, \ldots$, is said to be *infinite*, i.e., to contain an infinite number of terms. A series that has an end, a last term, is finite. Let s_n denote the sum of the *first n* terms of an infinite series. If the series be such that there is a finite number L from which, by taking n large enough, s_n may be made to differ by less than any prescribed amount and to which s_n, as n continues to increase, approaches nearer and nearer in value, then L is named *limit of s_n as n increases endlessly*, the series is said to be *convergent* (see SERIES) and L is called the *sum* (to infinity) of the series. Observe that here the word *sum* is used in a new sense, viz., as limit of a sum (in old sense). Now consider the *infinite G.P.*, a, ar, $ar^2, \ldots, ar^{n-1}, ar^n, \ldots$. The sum s of the first n terms, by the foregoing formula for s, is: $s_n=\frac{a}{1-r}-\frac{ar^n}{1-r}$. If the *G.P.* is a decreasing one, $r<1$ numerically, r^n approaches *zero* as *limit* as n increases without bound, and hence s_n has $\frac{a}{1-r}$ for limit, the *G.P.* is a convergent series, and its sum to infinity is $s=\frac{a}{1-r}$. For example, the sum of the infinite series, $1, \frac{1}{2}, \frac{1}{4}, \ldots$, is $s=\frac{1}{1-\frac{1}{2}}=2$.

Harmonical Progression.— An *H.P.* is a series of numbers such that the series of their reciprocals is an *A.P.* Hence the typical *H.P.* is

of the form $\frac{1}{a}, \frac{1}{a+d}, \frac{1}{a+2d}, \cdots, \frac{1}{a+(n-1)d}$. It is obvious that every problem involving an *H.P.* is convertible into a problem involving an *A.P.* If a and b be any two numbers, their *arithmetic mean* is a number c such that the series a, c, b is an *A.P.* Hence $c-a=b-c$, whence $c=\frac{1}{2}(a+b)$; i.e., the arithmetic mean of two numbers is half their sum. The *geometric mean* of a and b is a number c such that the series a, c, b is a *G.P.* Hence $\frac{c}{a}=\frac{b}{c}$, whence $c=\sqrt{ab}$; i.e., the geometric mean of two numbers is the square root of their product. The harmonic mean of a and b is c, where c is such that the series a, c, b is an *H.P.* Hence $\frac{1}{a}, \frac{1}{c}, \frac{1}{b}$ is an *A.P.* Hence $\frac{1}{c}-\frac{1}{a}=\frac{1}{b}-\frac{1}{c}$, whence $c=\frac{2ab}{a+b}$. Denote by A, G and H respectively the arithmetic, the geometric and the harmonic means of a and b. Then $A=\frac{1}{2}(a+b)$, $G=\sqrt{ab}$, $H=\frac{2ab}{a+b}$. It is readily seen that $H=G^2:A$, whence $G=\sqrt{AH}$; i.e., the geometric mean of two numbers is the geometric mean of their arithmetic and their harmonic means.

The Binomial Theorem or Expansion.—If a and b are any numbers and n is any positive integer,

$$(a+b)^n = a^n+na^{n-1}b+\frac{n(n-1)}{1\cdot 2}a^{n-2}b^2+\ldots$$
$$+\frac{n(n-1)(n-2)\ldots(n-r+1)}{1\cdot 2\cdot 3\cdot\ldots\cdot r}a^rb^{n-r}+\ldots$$
$$+nab^{n-1}+b^n,$$

an expansion containing $n+1$ terms. For proof of the relationship see article MATHEMATICAL INDUCTION. It can be proved by algebraic means, most readily by Maclaurin's formula (see CALCULUS), that, if a is numerically greater than b and n is any real number, the same expansion as that above given is valid, i.e., $(a+b)^n=a^n+na^{n-1}b+\ldots$, which, however, contains an infinite number of terms, except in the case where n is a positive integer. The equation is called the *binomial theorem*. It was discovered by Sir Isaac Newton, but its correctness was not proved by him. One of the simplest of its countless applications is its application to the problem of finding correct to any required degree of approximation any real root of any real number. For example, suppose it is desired to know the real cube root of 25 correct to five decimal places. We may proceed as follows:

$$\sqrt[3]{25}=(25)^{\frac{1}{3}}=(27-2)^{\frac{1}{3}}=(3^3-2)^{\frac{1}{3}}=(3^3)^{\frac{1}{3}}$$
$$-\tfrac{1}{3}(3^3)^{-\frac{2}{3}}(2)-\tfrac{1}{9}(3^3)^{-\frac{5}{3}}2^2-\tfrac{5}{81}(3^3)^{-\frac{8}{3}}2^3\ldots-$$
$$=3-\frac{2}{3\cdot 3^2}-\frac{4}{9\cdot 3^5}-\frac{40}{81\cdot 3^8}-\ldots=2.92402.$$

The Number e and the Series for e^x.—If n be numerically greater than 1, the foregoing theorem yields the equations

$$\left(1+\frac{1}{n}\right)^n-1+1+\frac{1-\frac{1}{n}}{2!}+\frac{\left(1-\frac{1}{n}\right)\left(1-\frac{2}{n}\right)}{3!}+\ldots;$$

$$\left(1+\frac{1}{n}\right)^{nx}=1+x+\frac{x\left(x-\frac{1}{n}\right)}{2!}+$$
$$\frac{x\left(x-\frac{1}{n}\right)\left(x-\frac{2}{n}\right)}{3!}+\ldots.$$

Hence

$$\left\{1+1+\frac{\left(1-\frac{1}{n}\right)}{2!}+\frac{\left(1-\frac{1}{n}\right)\left(1-\frac{2}{n}\right)}{3!}+\ldots\right\}^x$$
$$=1+x+\frac{x\left(x-\frac{1}{n}\right)}{2!}+\frac{\left(x-\frac{1}{n}\right)\left(x-\frac{2}{n}\right)}{3!}+\ldots.$$

This equation is valid for every value of n numerically greater than 1. The limits approached by its members as n increases beyond every finite value are equal, and it may be shown to result from this that

$$\left(1+1+\frac{1}{2!}+\frac{1}{3!}+\ldots\right)^x=1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots.$$

The series on the right is convergent for every finite value of x; in fact, for any given value of x, the series after a certain number of terms converges more rapidly than any decreasing *G.P.* The series on the left is a special case of that on the right, viz., $x=1$. The *limit* of the sum of the first n terms of the series on the left, i.e., its sum (to infinity) is denoted by e; accordingly the equation may be written: $e^x=1+x+\frac{x^2}{2!}+\frac{x^3}{3!}+\ldots$ The meaning is that the number e raised to a power indicated by a given value of x is the sum to infinity of the series for that value of x. Since $e=1+1+\frac{1}{2!}+\frac{1}{3!}+\ldots$ its approximate value can be readily calculated. That value, correct to 10 decimal places, is $e=2.7182818284$. The number e, one of the most important of all numbers, is incommensurable, i.e., not exactly expressible as a rational fraction, and it is *transcendental*, i.e., not a root of an equation $ax^n+bx^{n-1}+\ldots=0$ where the coefficients $a, b, \ldots$ are integers (see GENERAL THEORY OF ASSEMBLAGES).

Logarithms.—Let a be any positive number greater than 1. If $a^x=N$, x is named *logarithm of N to the base a*; symbolically, $x=\log_a N$ or, if the base is supposed known, simply $x=\log N$. If a be fixed, x and N will vary each with the other, each is a function of the other. Since $a^0=1$, $\log 1=0$ no matter what the base. But in general the logarithm of a given number will vary with the base; thus, since $2^4=16$, $4^2=16$, $\log_2 16=4$, $\log_4 16=2$. The general connection can be readily found thus: let $a^x=N$ and $b^y=N$, then $\log_a N=x$ and $\log_b N=y$; also $a^x=b^y$, $a=b^{\frac{y}{x}}$, $\log_b a=\frac{y}{x}=\frac{\log_b N}{\log_a N}$ whence $\log_b N=\log_a N.\log_b a$. Calling a the old and b the new base, it is seen that the logarithm of a given number to a new base is equal to the product of the logarithm of the number to the old base and the logarithm of the new base to the old base. Let $a^x=N$, $a^y=M$, then $a^{x+y}=NM$; hence the logarithm of a product is the sum of the logarithms of the factors. Again, $(a^x)^k=N^k=a^{kx}$; whence it is seen that

the logarithm of the kth power of a number is k times the logarithm of the number. Once more, $\log \frac{a^x}{a^y} = x - y$; that is, the logarithm of a fraction is equal to that of the numerator minus that of the denominator. Logarithms to the base 10 are called *common* logarithms or *Briggsian* logarithms after Briggs, who introduced them in 1615. These are used in practical computation, but in theoretical work logarithms are referred to the number e, the *Napierian* base, so called after Napier (1550–1617), the inventor of logarithms.

Let N be any number and n any positive integer. Then $\log_{10}(N \cdot 10^n) = \log_{10} N + n \log_{10} 10 = n + \log_{10} N$; and $\log_{10}(N \div 10^n) = \log_{10} N - n \log_{10} 10 = -n + \log_{10} N$. Now multiplication or division by a power of 10 has only the effect of moving the decimal point, while the logarithm of the product, as just seen, is equal to that of the multiplicant (or dividend) increased (or decreased) by an integer. Accordingly, if two numbers differ only in the position of the decimal point, their logarithms differ only in respect to the integral part (called the *characteristic*), the fractional part (called the *mantissa*) being the same in both. In that fact resides the chief practical advantage of the Briggsian system. For example, if $\log_{10} 2.23 = .3483$, it follows that $\log_{10} 22.3 = 1.3483$; and $\log_{10} .00223 = \log_{10}(2.23 \div 10^3) = -3 + .3483$, or 3.3483, as *negative* characteristics are often written. It is easy to see that the characteristic of a logarithm is $+n$ if the number has $n+1$ figures before the decimal point, and is $-n$ if the number is a pure decimal in which the point is followed by $n-1$ zeros. Thus, $\log_{10} 23506.054 = 4 +$ a pure decimal, and $\log_{10} .0008953 = -4 +$ a pure decimal.

Logarithmic Series, Calculation of Logarithms. It may be shown by the methods of the differential calculus that if $x < 1$, $\log_e(1+x) = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} - \ldots$, the *logarithmic* series. Similarly, $\log_e(1-x) = -x - \frac{x^2}{2} - \frac{x^3}{3} - \frac{x^4}{4} - \frac{x^5}{5} - \ldots$ The logarithmic series converges *slowly* for all but small values of x. It is on that account ill adapted to the computation of Napierian logarithms. A series better adapted to such calculation is, however, readily obtained as follows: From the last two series it follows that $\log_e \frac{1+x}{1-x} = 2\left(x + \frac{x^3}{3} + \frac{x^5}{5} + \ldots\right)$. Put $x = \frac{m-n}{m+n}$, so that $\frac{1+x}{1-x} = \frac{m}{n}$; then

$$\log_e \frac{m}{n} = 2\left\{\frac{m-n}{m+n} + \frac{1}{3}\left(\frac{m-n}{m+n}\right)^3 + \frac{1}{5}\left(\frac{m-n}{m+n}\right)^5 + \ldots\right\},$$

a rapidly converging series that may be used for the calculation of logarithms as follows. For $m=2$ and $n=1$, we get $\log_e 2 = 0 + 2\{\frac{1}{3} + \frac{1}{3}(\frac{1}{3})^3 + \ldots\}$, whence $\log_e 2 = .693147$ (correct to six decimal places). For $m=3$ and $n=2$, the series gives $\log_e 3 = \log_e 2 + 2\{\frac{1}{5} + \frac{1}{3}(\frac{1}{5})^3 + \ldots\} = 1.098612$. Taking $m=5$ and $n=3$, it is found that $\log_e 5 = 1.609438$. Then $\log_e 4 = 2\log_e 2$, $\log_e 6 = \log_e 2 + \log_e 3$, $\log_e 8 = 3\log_e 2$, and so on. In particular $\log_e 10 = \log_e 2 + \log_e 5 = 2.302585$. Since $\log_{10} N = (\log_e N)(\log_{10} 10)$, it is seen that the common logarithm of any number may be found from the Napierian longarithm of that number by multiplying the latter logarithm by 2.302585. This last is called the *modulus of common logarithms*. It is obviously possible to calculate logarithms that shall be correct to any prescribed number of decimal places. Logarithms correct to 3 or 4 places are sufficiently accurate for all ordinary computations, though tables correct to 5, 6, 7 and even 10 or more places are often employed. By means of any such table can be found the logarithm of any given number and conversely. The number corresponding to a given logarithm is often called the *antilogarithm*. The advantage of logarithmic over ordinary computation is easily seen. Thus to find the product of two or more numbers, it suffices to add their logarithms and then to take the antilogarithm of the sum. To extract any root, say the 7th, of any number, it suffices to divide the logarithm of the number by 7 and to take the antilogarithm of the quotient. To find the quotient of two numbers, it suffices to subtract the logarithm of the divisor from that of the dividend and to take the antilogarithm of the difference. The *cologarithm* of a number is the logarithm of the reciprocal; thus, $\operatorname{colog} n = \log 1 = \log \frac{1}{n} = \log 1 - \log n = 0 - \log n$; hence to subtract a logarithm is equivalent to adding the corresponding cologarithm.

Undetermined Coefficients.— Reference was made above to this subject, of which some account will now be given. Let $f(x) \equiv a_0 x^n + a_1 x^{n-1} + a_2 x^{n-2} + \ldots + a_{n-1} x + a_n$, a rational integral function of degree n in x. It can be proved and is here assumed that any such function vanishes for some value of the variable. If $f(r_1) = 0$, then, by the factor theorem, $f(x) \equiv (x - r_1) f'(x)$, where $f'(x) \equiv a_0 x^{n-1} + \ldots$ If $f'(r_2) = 0$, then $f'(x) \equiv (x - r_2) f''(x)$, where $f''(x) \equiv a_0 x^{n-2} + \ldots$, and hence $f(x) \equiv (x - r_1)(x - r_2) f''(x)$. By the argument here exemplified it is proved that $f(x)$ may be put in the form $f(x) \equiv a_0 (x - r_1)(x - r_2) \ldots (x - r_n)$. Each of the n numbers $r_1, r_2, \ldots, r^n$ causes $f(x)$ to vanish; hence the n numbers are roots of the equation $f(x) = 0$. It can be easily seen that the equation $f(x) = 0$ cannot have more than n different roots unless its coefficients are each zero; that is, $f(x)$ cannot vanish for more than n different values of x unless $a_0 = a_1 = \ldots = a_n = 0$. For if $f(r_{n+1}) = 0$, then $a_0(r_{n+1} - r_1)(r_{n+1} - r_2) \ldots (r_{n+1} - r_n) = 0$, but by hypothesis no $(\ ) = 0$, hence $a_0 = 0$, and $f(x) = a_1 x^{n-1} + \ldots$ As the latter is to vanish for more than $n-1$ values of x, $a_1 = 0$. In like manner it would follow that $a_2 = 0, \ldots, a_n = 0$. But if the coefficients are each zero, $f(x)$ vanishes for every x, so that if $f(x)$ vanishes for more than n values of x, it vanishes for all x's. Now suppose that $a_0 x^n + a_1 x^{n-1} + \ldots + a_n$ is to be equal to $b_0 x^n + b_1 x^{n-1} + \ldots + b_n$ for all values of x, then the function $(a_0 - b_0) x^n + (a_1 - b_1) x^{n-1} + \ldots + (a_n - b_n)$ must vanish for every value of x, and, consequently, $a_0 = b_0$, $a_1 = b_1, \ldots, a_n = b_n$. Hence two rational integral functions of degree n in x are equal for all values of x, i.e., are *identical*, when and only when the coefficients of like powers of x are equal. This proposition enables us to solve many problems involving the determination of *undetermined coefficients*. For example, suppose it required to find the sum of the squares of the first n integers. Assume the identity

$1^3+2^3+\ldots+(n-1)^3+n^3 \equiv a+bn+cn^2+dn^3+en^4+\ldots+qn^k$, where the coefficients $a, b, \ldots q$ are to be determined. Replacing n by $n+1$, we obtain $1^3+2^3+\ldots+n^3+(n+1)^3 \equiv a+b(n+1)+c(n+1)^2+d(n+1)^3+e(n+1)^4+\ldots$ By subtracting corresponding members of the identities, there results the identity $n^3+2n+1 \equiv b+2cn+c+3dn^2+3dn+d+4en^3+6en^2+4en+e+\ldots$ As this relation is to be valid for every value of n, coefficients of like powers of n must be equal. Hence $e=0$, $f=0$, $\ldots$, $1=3d$, $2=3d+2c$, $1=b+c+d$; hence $b=\frac{1}{2}$, $c=\frac{1}{2}$, $d=\frac{1}{3}$. Accordingly, $1^2+2^2+\ldots+(n-1)^2+n^2=a+\frac{1}{2}n+\frac{1}{2}n^2+\frac{1}{3}n^3$, true for every value of n, hence for $n=1$, and hence $a=0$. Therefore $1^2+2^2+\ldots+n^2=\frac{1}{6}n(n+1)(2n+1)$.

Part-fractions.— The so-called principle of undetermined coefficients has frequent application in the solution of the problem, to decompose a given fraction into part-fractions (commonly called partial fractions) whose sum shall be the given fraction. Any fraction whose terms are rational integral functions of x may be thus decomposed. The method of procedure may be made sufficiently clear by a few examples. It will be observed that the problem is in a sense the inverse of the problem of summing fractions.

For example, the sum of $\frac{2}{x}$, $\frac{5}{3(1-x)}$, and $\frac{-1}{3(2+x)}$ is $\frac{x+4}{2x-x^2-x^3}$ or $\frac{x+4}{x(1-x)(2+x)}$. The inverse problem is: given the latter fraction, to find its components. It is plain that the only fractions whose denominators are linear and whose sum is a fraction of the proper denominator and a linear numerator are $\frac{a}{x}$, $\frac{b}{1-x}$, and $\frac{c}{2+x}$. Hence we assume: $\frac{x+4}{2x-x^2-x^3}=\frac{a}{x}+\frac{b}{1-x}+\frac{c}{2+x}$, whence $x+4=a(1-x)(2+x)+bx(2+x)+cx(1-x)$, which is to be valid for all values of x. Expanding the right-hand member and equating corresponding coefficients on right and left, we obtain: $4=2a$, $1=-a+2b+c$, $0=-a+b-c$; whence $a=2$, $b=\frac{1}{3}$, $c=-\frac{1}{3}$; and the component fractions are seen to be $\frac{2}{x}$, $\frac{5}{3(1-x)}$, $\frac{-1}{3(2+x)}$. For another example, we may take $F=\frac{4x^2+3x-1}{(x-1)^2(x+2)}$. A little reflection suffices to show that the assumption to be made is $F=\frac{a}{x-1}+\frac{b}{(x-1)^2}+\frac{c}{(x+2)}$. Then $4x^2+3x-1=a(x-1)^2+b(x-1)(x+2)+c(x+2)$; equating coefficients and solving the resulting equations, it is found that $a=1$, $b=3$, $c=2$. In case a factor of the given denominator is repeated k times, as in $\frac{N}{mx+n^k(px+q)}$, the assumption to be made is: given fraction $=\frac{a_1}{mx+n}+\frac{a_2}{(mx+n)^2}+\ldots+\frac{ak}{(mx+n)^k}+\frac{b}{(px+q)}$. If F is of the form $\frac{N}{(mx^2+nx+l)^k(px+q)^s(gx+h)}$, then assume $F=\frac{ax+b}{mx^2+nx+l}+\frac{ax+b}{(mx^2+nx+l)^2}+\ldots+\frac{ax+b}{(mx^2+nx+l)^k}+$ etc., as before. If N is of degree equal to or higher than that of the given denominator, F is converted by division into an integral function + a fraction the degree of whose denominator exceeds that of its numerator. The latter fraction is then decomposed by the methods above indicated.

Indeterminate (Undetermined, Evanescent, Illusory) Forms.— In case of a fraction, $\phi(x) \equiv \frac{f(x)}{F(x)}$, it may happen that both terms vanish for some value of x, as $x=a$, yielding the form $\frac{0}{0}$, which, as division by zero is meaningless, is itself without meaning and is commonly called indeterminate. In such case we are free (logically) to *give* the form a meaning, any meaning or value whatever. But while all meanings (values) are allowable, not all are expedient. For example, $\frac{x^2-a}{x-a}$ has a definite value for every x-value except $x=a$. For this value the fraction takes the form $\frac{0}{0}$. To this we might assign the value of 5 or -3, or any other. But such a choice would be motiveless. On the other hand, $\frac{x^2-a^2}{x-a}=x+a$ for all values of x except a; for this *critical* value a, the right member takes a definite value, $2a$, which is accordingly suggested as the value to be naturally assigned to the indeterminate form in this case. The decisive motive for this choice lies yet deeper: it is that as x varies through a sequence of values, say $a+\frac{1}{3}$, $a+\frac{1}{4}$, $a+\frac{1}{5}$, ..., having a as limit, the corresponding sequence of fraction-values, $2a+\frac{1}{3}$, $2a+\frac{1}{4}$, $2a+\frac{1}{5}$, ..., approaches $2a$ as limit. Accordingly, if $\phi(x)$ assumes the form $\frac{0}{0}$ for $x=a$, the value assigned to $\phi(a)$ is the limit value which the sequence of fraction-values approaches as x approaches a through any sequence x-values for each of which $\phi(x)$ has a definite value. The fraction $\phi(x)$ may be such that as x approaches a, $f(x)$ approaches a definite value other than zero and that $F(x)$ approaches zero. Such a fraction is $\frac{x-a+4}{x-a}$. In such case the fraction-value obviously becomes larger and larger, surpassing every prescribed number, a fact commonly expressed by saying that as x approaches a, $\phi(x)$ approaches positive or negative infinity (∞ or $-\infty$) according as the numbers in the fraction sequence are positive or negative. If, as x approaches a, both $f(x)$ and $F(x)$ approach ∞, then, for $x=a$, $\phi(x)$ assumes the indeterminate form $\frac{\infty}{\infty}$. But it may be made to take the form $\frac{0}{0}$, since $f(x)+F(x)=(1+F(x))+(1+f(x))$. Other indeterminate forms also reducible to the form $\frac{0}{0}$, are $0.\infty$, ∞, 0, $\infty-\infty$, ∞^0, 0^∞. For further treatment see CALCULUS.

The boundary of what is or should be called elementary algebra is ill defined alike in theory and in practice, and besides the topics dealt with in this article other subjects are briefly treated in some of the elementary textbooks. Of such additional subjects, the more important as *chance* or *probability*, the *complex variable*, and *theory of numbers*, *series*, and others, are

subjects of special articles in this work. Relatively meagre, merely introductory, textbooks of algebra are sometimes quite absurdly described in their titles as "complete," and others that might be called advanced are improperly characterized as "higher." The better usage has appropriated the term higher algebra to the doctrine of invariants and covariants (q.v.).

Bibliography.— Textbooks of elementary algebra, good, bad and indifferent, are very numerous. The most scientific work on the subject is that of Weber and Wellstein: 'Elementare Algebra and Analysis.' The most comprehensive elementary English textbook is Chrystal's 'Algebra' (2 vols.).

CASSIUS J. KEYSER,
Professor of Mathematics, Columbia University.

ALGEBRA, History of the Elements of. Taking the definition of algebra as given in the article under that title (q.v.), the history of the subject goes back to the early Egyptians. In a certain hieratic papyrus now in the British Museum, copied by one Ahmes (*Aāhmesu*, the moon-born), about 1700 B.C., from a work written some centuries earlier, several traces of algebra appear. There are symbols for addition, subtraction and equality, and 11 examples of linear equations with one unknown quantity are given. The unknown quantity is called *hau*, or heap, the first example involving an equation being "Heap, its seventh, its whole, it makes nineteen" that is, $\frac{x}{7}+x=19$. A number of applied problems are also given, and Ahmes shows some familiarity with arithmetic and geometric progression. Such was the stagnation of the later Egyptians, however, that algebra never advanced beyond this point, on the banks of the Nile, at least until Greek influence established the famous school of Alexandria.

The Greek mind turned to the science of form rather than to that of number (see GEOMETRY, HISTORY OF THE ELEMENTS OF), and consequently but few evidences of algebra are found in Greece during the golden age of philosophy. Whenever a need for algebra is met it is always for the solution of some geometric problem, and whenever a solution is effected it is usually by some device involving geometry. One of the earliest evidences of an algebraic symbolism is seen in a problem of Aristotle's, in which he represents quantities by means of letters, letting A stand for the moving force, B for that by which it is moved, Γ for the distance, Δ for the time, and so on. About the same time Hippocrates (q.v.) called for the square of a number δύναμις (power), from which the Latins derived the name *potentia*, which appears in our language as *power*. Euclid (q.v.), c. 300 B.C., proved geometrically certain fundamental laws of algebra, such as $a(b+c)=ab+ac$, $(a+b)^2=a^2+2ab+b^2$, $(a-b)^2=a^2-2ab+b^2$, and $(a+b)(a-b)=a^2-b^2$. The equation of the second degree was also known to the Greeks, and they were able to solve the general case by the aid of proportion. Archimedes (q.v.) is even said to have solved one case of the cubic, and he undoubtedly knew a considerable amount about series.

It was not however, until the time of Diophantus (q.v.), c. 300 A.D., that Greek algebra attained any standing as a separate science. This great mathematical genius improved the symbolism, divorced the subject from geometry, and created the ancient science of indeterminate equations, a science called in his honor "Diophantine Analysis."

For reasons above suggested, algebra flourished more naturally in the Orient than in Greece. The first Hindu algebraist of any importance was Aryabhata, who was born at Pataliputra, on the Upper Ganges, in 476 A.D. Part of his "Aryabhatiya" is devoted to algebra, and covers the fundamental operations, rules for square and cube roots, progressions, permutations, equations of the first and second degrees with one unknown quantity, and some treatment of indeterminate equations. Aryabhata differs from Diophantus in that he considers algebra from a broader standpoint, treating it rather as a theory of elementary functions than as the science of a particular form of the equation.

The next great algebraist in the East was Al Khowarazmi (q.v.), c. 800 A.D., so called from his birthplace, Kharazm, the territory of the modern Khiva. With him algebra takes a still different meaning. It is no longer the theory of indeterminate equations of Diophantus, nor is it chiefly the theory of elementary functions of Aryabhata, but it becomes primarily the general theory of equations. Indeed, the title of his work 'ilm al-jabr wa' l muqābalah,' means the science of redintegration and equation, a title from which only the words *al-jabr* have survived, giving the accidental name of *algebra* to the subject. Al Khowarazmi solved three types of the quadratic, in modern symbolism $x^2+ax=b$, $x^2-ax=b$, $x^2+b=ax$, thus showing his inability to generalize, a failing with al. writers before the 17th century.

It was two centuries before another writer of prominence appeared. About 1010 A.D., Al Karchi, like Al Khowarazmi of the Bagdad school, wrote a treatise in which he shows familiarity with the works of his predecessors rather than great genius himself. Like many of the older writers, he gives attention to those rules for approximating roots, so necessary before the time of decimal fractions. Stated in modern symbolism his rule for square root is $\sqrt{a}=w+\frac{a-w^2}{2w+1}$, where w is in the neighborhood of $\sqrt{a}$; that is, $\sqrt{10}=3+\frac{10-9}{6+1}=3\frac{1}{7}$, whence $\sqrt{10}$ was often used for π. He also gives the rule $\sqrt{a+b\pm\sqrt{4ab}}=\sqrt{a}\pm\sqrt{b}$, and a rule for Σn^3.

In the 12th century two Oriental writers of prominence appear, Omar Khayyam (q.v.), the Persian, who died in 1123, and Bhaskara, the Hindu, who was born in 1114. Omar solved one case of the cubic, and was the first to treat equations above the second degree in a systematic manner. The binomial theorem with positive integral exponents was also known to him. His algebra, published in Paris, both in Arabic and in French, made Omar known in the West as an algebraist some time before FitzGerald made him celebrated as a poet.

Bhaskara wrote on both arithmetic and algebra, and his work has long been known in Europe through Colebrook's English transla-

tion. Among the features of his algebra is the statement that $\frac{a}{o} = \infty$, and the solution of the quadratic by the reduction of $ax^2 + bx + c = 0$ to the form $(2ax + b)^2 = -4ac + b^2$, a device known in England as the Hindu Method.

The rise of modern elementary algebra took place in Italy in the 16th century. It was at this time that the cubic was solved by Tartaglia (q.v.), the publication being made by Cardan (q.v.) in his *Ars Magna* in 1545. The solution of the quartic soon followed, after which the quintic occupied the attention of algebraists until its solution was proved to be impossible by the operations of elementary algebra, in the 19th century. A common name for algebra at this time was "L'arte maggiore" (the greater art, whence the Latin title of Cardan's treatise), arithmetic being called by contrast "L'arte menore" (the lesser art). The unknown quantity was called, in Latin, *res,* whence the Italian translation *cosa* (thing). On this account the science was called the *Coss* in the early German schools, and the name "Cossic Art" was not uncommon among the English writers of about 1600. The mere processes and solutions of elementary algebra were fairly perfected by the close of the 16th century, and little besides the symbolism was needed to make the subject what it is to-day.

The title of Father of Modern Elementary Algebra is frequently given to Vieta (q.v.). He was the first to devise a systematic and fairly satisfactory scheme of literal notation, using vowels for the unknown quantities and consonants for the knowns. For example, he used *A* where we use x, *Aq* (*A quadratus*) for our x^2, *Ac* for x^3, *Aqq* for x^4, and so on. He also recognized that a letter may represent both a positive and a negative number, and both an integer and a fraction, a generalization not recognized by his predecessors, and one that was perfected later by Descartes. Vieta was also the first to recognize the advantage of making the second member zero in considering an equation. His work greatly influenced the English algebra as set forth by Harriot (q.v.), who acknowledged his indebtedness to him. Mention should also be made of the work of Clavius, who did much to meet the demand for a usable textbook at this period.

The final touch was put upon the elementary science by Descartes (q.v.), who suggested and used our modern literal notation, and who perfected the generalizations begun by Vieta. His introduction of the graphic treatment of equations not only revolutionized mathematics in general, but materially assisted in the understanding of the elements.

Since Descartes's time there have been certain improvements in the symbolism of elementary algebra, the theory of approximate solutions of numerical higher equations has been created, chiefly through the efforts of Newton, Euler and Horner (qq.v.), the binomial theorem has been generalized for negative and fractional exponents, principally by the labors of Newton, the theory and the symbolism of determinants (q.v.) have been developed, the various number systems met in algebra (notably the complex number system) have been placed upon a scientific basis, and in general the foundation theories of the science have been greatly strengthened.

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DAVID EUGENE SMITH,
Professor of Mathematics, Teachers College, Columbia University, New York.

ALGECIRAS, äl'ja-sē'ras, or äl'ha-thē'ras, a seaport of Spain, on the west side of the Bay of Algeciras and on the left bank of the Miel, the mouth of which forms the harbor. Lying only six miles west of Gibraltar (easily reached by ferry, etc.), it has become a winter resort, much appreciated by British and American visitors, as well as by wealthy Spaniards, on account of delightful gardens, bathing-beach, etc. From this town large quantities of cork are exported; also grain, leather, stone, charcoal, etc. History deals first with the much older town, vestiges of which lie to the southwest beyond the river and railway. Old Algeciras, then, was founded by the Moors in 713, two years after their first invasion of the peninsula; and the original form of the name is Moorish (al-Gezira al-Khadrâ, signifying "green island"). Taken from the Moors by Alfonso XI in 1344, the old town was recaptured by Mohammed V of Granada 24 years afterward and almost entirely destroyed. In the comparatively modern town (colonized by the Spaniards who left Gibraltar in 1704) the Casa Consistorial was the scene of the Morocco conference, 17 Jan.–7 April 1906. See MOROCCO, HISTORY.

ALGER, Cyrus, an American inventor: b. West Bridgewater, Mass., 11 Nov. 1781; d. Boston, 4 Feb. 1856. He learned the iron foundry business, and in 1809 established himself in South Boston, where he soon made himself widely known by the excellence of the ordnance he manufactured. He supplied the United States government with a large quantity of cannon balls during the War of 1812; produced the first gun ever rifled in America, as well as the first perfect bronze cannon; and supervised the casting of a mortar which was the largest gun of cast-iron that had then been made in the United States. Subsequently he made improvements in the construction of time fuses for bomb-shells and grenades; patented a method of making cast-iron chilled rolls; and was the original designer of the cylinder stove.

ALGER, Horatio, an American writer of juvenile books: b. Revere, Mass., 13 Jan. 1834; d. Natick, Mass., 18 July 1899. He was graduated at Harvard in 1852, settled in New York in 1866 and became interested in the condition of self-supporting boys, described in his series of more than 50 books, including 'Ragged Dick,' 'Tattered Tom,' 'Luck and Pluck,' which became very popular. Other works: 'Nothing to Do: A Tilt at Our Best Society,' a poem (1857); 'Helen Ford,' a novel (1860); a series of juvenile biographies of Webster, Lincoln, Garfield, etc.; and 'The Young Salesman' (1896).

ALGER, Russell Alexander, an American merchant, capitalist and politician: b. Lafayette, Ohio, 27 Feb. 1836; d. Washington, D. C., 24 Jan. 1907. He served in the Civil War, rising from a captaincy to the rank of brevet major-general of volunteers. He was governor of Michigan from 1885 to 1887; a candidate for the Republican presidential nomination in 1888; commander-in-chief of the Grand Army of the Republic (1889–90); and became Secretary of War in President McKinley's Cabinet in 1897. Almost from the beginning of the Spanish-American War of 1898, he was the object of much public censure for alleged shortcomings in the various bureaus in his department, and this pressure became so strong and widespread that he resigned his office in 1899 after an investigation committee had exonerated him. From 27 Sept. 1902 till his death he was senator from Michigan. In 1901 he published 'The Spanish-American War.'

ALGER, William Rounseville, Unitarian clergyman: b. Freetown, Mass., 30 Dec. 1822; d. Boston, Mass., 7 Feb. 1905. He was graduated at the Harvard Theological School 1847; filled pastorates in Roxbury, Mass.; Boston, New York, Denver, Chicago, Portland, Me. Works: 'Poetry of the Orient' (1856); 'Critical History of the Doctrine of a Future Life' (1861); 'Genius of Solitude' (1861); 'Friendships of Women' (1867); 'Life of Edwin Forrest' (2 vols., 1878); 'Symbolic History of the Cross' (1881).

ALGERIA, a French colony in north Africa, situated between lat. 30° and 37° N. and long. 2° 10′ W. and 8° 50′ E., having on the north the Mediterranean, on the east Tunis, on the west Morocco and on the south (where the boundary is ill-defined) the Desert of Sahara; area 184,474 square miles, or including the Algerian Sahara, 343,500. The country has been organized in two great divisions: Northern Algeria, consisting of the three departments — Algiers, Oran and Constantine, containing 17 arrondissements and 269 communes, 74 of which are mixed; and Southern Algeria, consisting of the four territories of Ain Sefra, Ghardaia, Touggout and the Saharan Oases, organized under decree of 14 Aug. 1905. They contain five mixed and seven native communes. The coast line is about 550 miles in length, steep and rocky, and though the indentations are numerous the harbors are much exposed to the north wind. The country is traversed by the Atlas Mountains, two chains of which — the Great Atlas, bordering on the Sahara, and the Little, or Maritime, Atlas between it and the sea — run parallel to the coast, the former attaining in Mount Shelia, its loftiest peak, a height of 7,611 feet. The intervals are filled with lower ranges, and numerous traverse ranges connect the principal ones and run from them to the coast, forming elevated table lands and enclosed valleys. The rivers are numerous, but many of them are mere torrents rising in the mountains near the coast. The Shelif is much the largest. Some of the rivers are largely used for irrigation, and artesian wells have been sunk in some places for the same purpose. There are, both on the coast and in the interior, extensive salt lakes or marshes (shotts) which dry up to a great extent in summer. The country bordering on the coast, called the Tell, is generally hilly, with fertile valleys; in some places a flat and fertile plain extends between the hills and the sea. In the east there are shotts that sink below the sea-level, and into these it has been proposed to introduce the waters of the Mediterranean. The climate varies considerably according to elevation and local peculiarities. There are three seasons; winter from November to February, spring from March to June and summer from July to October. Rain falls plentifully from December to March. The summer is very hot and dry and the sirocco, or hot desert wind, often blows. In many parts of the coast the temperature is moderate and the climate so healthy that Algeria is now a winter resort for invalids. Agriculture is carried on chiefly in the small but fertile area near the coast, known as the Tell, mainly owned by the Europeans, and artificially irrigated.

Products.— The chief products are wheat, barley and oats, tobacco, cotton, wine, silk and dates. Early vegetables, especially potatoes, asparagus and peas, are exported to France and England. A fibre called alfa, a variety of Esparto, which grows wild on the high plateaus, is exported in large quantities. The forest area is estimated at 6,559,490 acres, belonging principally to the state and the communes. Much of it is brushwood, but in the Tell Atlas grow various sorts of pines and oaks, ash, cedar, myrtle, pistachio nut and the cork-oak, covering 645,000 acres and furnishing large quantities of cork for exporting. Portions of the area are also leased for tillage and for pasturage for cattle, sheep, horses and pigs introduced by the French. Wild animals are not numerous, the lion and ostrich having been exterminated, but hyenas and jackals, a species of ape and occasionally camels are to be found. Algeria possesses valuable minerals, including iron, copper, lead, sulphur, zinc, antimony, marble (white and red), phosphate, petroleum and mercury.

Trade.— The trade of Algeria has greatly increased under French rule, France, Spain, England and Germany being the countries with which it is principally carried on, and three-fourths of the whole being with France. In 1909 the exports amounted to $64,845,000, the imports to $90,950,000; in 1913 exports had increased to $102,100,000 and imports to $133,500,000. The exports, besides those mentioned above, are wine, olive oil, raw hides, wood, wool, tobacco, oranges and other fruits, etc.; the imports are manufactured goods, cottons, woolens, machinery, clothing, coal, coffee, etc. French money, weights and measures are generally used. The chief towns are Algiers, Oran, Constantine, Bone, Philippeville and Tlemcen.

Industries.— The wine business constitutes the largest industry in Algeria, the yield in 1913 being 163,476,236 gallons. The production of olive oil is also important as well as the cultivation of oranges, dates and other fruits, silk, tobacco, flax and cotton. Alfa and the dwarf palm are largely worked in the plains. The number of the population engaged in agriculture in 1909 was 322,520, of whom 213,756 were Europeans. The chief crops are wheat, barley and oats. The northern portion of Algeria is better adapted to grazing and forestry. There are extensive fisheries, $1,028,050 worth of fish

having been caught in 1912. In 1913, 96 mines were being worked, there were 2,793 miles of railway and 8,977 miles of telegraph line. In 1914, 3,741 vessels entered and 4,595 vessels cleared at Algerian ports. National roads have a length of 1,826 miles.

Population.— The two principal races inhabiting Algeria are Arabs and Berbers. The former are mostly nomads, dwelling in tents and wandering from place to place, though a large number of them are settled in the Tell, where they carry on agriculture and have formed numerous villages. The Berbers, of whom the Kabyles are a part, are the original inhabitants of the territory and still form a considerable part of the population. They speak the Berber language, but use the Arabic characters in writing. The inhabitants of the towns are largely so-called Moors, and the Jews form a small but influential part of the population. Various other races also exist. Except the Jews all the native races are Mohammedans. There are now a considerable number of French and other colonists, provision being made for granting them concessions of land on certain conditions. In 1906 there were 449,420 colonists of French origin in Algeria, 117,475 Spaniards, 33,153 Italians, 17,849 other foreigners and 64,645 naturalized Jews. The total population in 1911, including military forces, was 5,563,828, of whom 795,522 were Europeans and 4,768,306 natives. In 1914 the number of troops was estimated at 63,827.

Government.— Algeria is governed by a governor-general, who is assisted by a consultative council and the superior council, composed of elected members and high officials. There are also three financial delegations who vote upon the budget. The three departments of Algiers, Constantine and Oran each send two deputies and one senator to the French Chambers, which alone have the right of legislating for Algeria. Since 1901 the budget has been distinct from that of France, but the expenses of the departments of War and Marine and guarantees of interest on railways are still borne by the mother country. In 1914 the budget estimate for northern Algeria was: Revenue, 171,364,550 francs ($34,272,910); expenditure, 171,325,658 francs ($34,265,131); for southern territories: Revenue, 5,060,522 francs ($1,012,104); expenditure, 5,029,423 francs ($1,005,884).

Justice.— Justice is administered by 16 courts of first instance, justices of the peace, commercial courts and a court of appeals. There are special tribunals for the natives.

History.— Down to the time of the Turkish dominion Algeria was historically inseparable from Tunisia and Morocco. Under the Romans it was included in the provinces of Numidia and East Mauritania and enjoyed great prosperity until the Vandal conquest in 440 A.D. Oriental civilization was introduced upon the conquest by the Arabs in the 7th and 8th centuries. After the expulsion of the Moors from Spain they established themselves in Algeria, and during the struggle which ensued between the aid of the Turkish corsair Horuk, known as Barbarossa, who declared himself Sultan of Algiers. His brother Khair-ed-Din, also known as Barbarossa, placed the country under the suzernaity of the Turkish Sultan, which was, however, later shaken off. A piratical state was established (see BARBARY AND BARBARY POWERS), and the Barbary corsairs, or Algerian pirates, as they were called, became the terror of the Christian nations, who 14 times besieged Algiers in vain, and some of whom were finally reduced to paying tribute to protect their commerce. A check to the depredations of the pirates was administered by a United States squadron under Decatur in 1815, but they did not finally cease until the conquest of Algeria by the French, begun in 1830, to avenge an insult to the French consul. Algiers was captured by Marshal Bourmont 5 July 1830 and after several years of warfare the bases were laid down of the political and administrative organization of the French possessions, consisting of six coast towns. The city of Constantine was captured in 1837, but resistance to the French had already been organized by the Emir Abd-el-Kader, and was waged with varying success until December 1847, when the Emir surrendered to General Lamoricière at Sidi-Brahim. The French conquest was then assured, although Great Kabylia was not subdued until 10 years later, when the French possessions were extended to the Sahara desert. Frequent insurrections had to be quelled later, the most serious being in 1870–71. French occupation of the Algerian Sahara started in 1890, and was accomplished in 1901 by the occupation of the Tuat and Tidikelt oases. Under the third republic Algeria has developed rapidly, politically and industrially. The civil territory has been greatly increased at the expense of the military; railroads and excellent roads have been built, schools have multiplied. In 1913 there were 22 schools for secondary instruction, with 6,686 pupils; 1,268 primary and infant schools, including 226 Mussulman schools, with 145,933 pupils; 4 normal schools for men teachers, with 110 students; 6 normal schools for women teachers, with 218 students; higher Mussulman schools are established at Algiers, Tlemcen and Constantine, and an institution for higher instruction at Algiers. In 1912 Tunisia, Algeria and Morocco were again united under French dominion.

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ALGERINE WAR. See BARBARY POWERS, U. S. TREATIES AND WARS WITH THE.

ALGHERO, ąl-gā'rō, or **ALGHERI,** Sardinia, a fortified town and seaport on the west side of the island in the province of Sassari, and 17 miles southwest of the town of that name. The port is not good, but seven miles west of it is Porto Conte, the best harbor in the island. The town is the seat of a bishop and

possesses a handsome cathedral. The inhabitants are mainly employed in wine-growing and coral-fishing, and calcium mines are operated. Pop. 12,000.

ALGIERS, ăl-jērz (French, *Alger*), Algeria, a city and seaport on the Mediterranean, capital of the French colony of Algeria, situated on the west side of the Bay of Algiers. It stands on the slope of a hill facing the sea, from which its array of white houses, rising in the form of an amphitheatre, presents an imposing appearance. The old town, which is the higher, has an Oriental aspect. Its crowning point is the Casbah, or ancient fortress of the deys, about 500 feet above the sea. Its streets are narrow, crooked and dirty. The houses are strong, prison-like edifices, with iron-grated slits for windows, looking into central quadrangles entered by a low doorway. The modern town, which occupies the lower slope and spreads along the shore, is handsomely built, with broad streets adorned with arcades and having elegant squares. It contains the government buildings, the barracks, the commercial warehouses, the residences of the governor-general and the government officials, and the superior courts of justice. The Place du Gouvernement and the Place Bresson here are the two chief squares of the city. The fine Boulevard de la République runs along the sea-front, overlooking the bay and harbor. Algiers was the Icosium colony of the ancient Roman empire and has a varied history. It is the seat of an archbishop, and has a cathedral and a number of churches (including an English church) and mosques. There are schools of law, medicine, science and letters, and a lyceum; also a library and museum. It is defended by sea-batteries and other works, and is an important naval station, prominent as a base for Mediterranean operations during the European War. The French at great expense improved the port and provided docks. Pop. 172,400.

ALGOA BAY, ăl-gō'a, Africa, a bay on the southeast coast of Cape Colony, about 420 miles east of the Cape of Good Hope. At its entrance, formed by Cape Woody on the northeast and Cape Recife on the southwest, it has a width of 33 miles. Its shelter is very valuable, as there is no other refuge for ships during the northwest gales. The usual anchorage is off Port Elizabeth, at the mouth of the Baakens, where there is now a large and increasing trade.

ALGOL, ăl'gŏl, a star in the constellation Persus (head of Medusa), remarkable as a variable star, changing in brightness from the second to the fourth magnitude.

ALGOMA, a district of Canada, on the north side of Lake Superior, forming the northwest portion of Ontario, rich in silver, copper, iron, etc.

ALGONA, Iowa, city and county-seat of Kossuth County, on the Iowa Cent., Chicago & N. W., and Chicago, M. & St. P. railways, about 123 miles north by west of Des Moines, on a branch of the Des Moines River. The city has four banks, handsome public buildings and flourishing manufactures of foundry and machine-shop products, wooden-ware, bricks and tiles. Pop. (1910) 4,100.

ALGONKIAN SYSTEM, the name given in the United States to a great series of rocks that succeeds the basal system of the Archean and is overlaid by the strata of the Paleozoic systems. In the Lake Superior region, the system is divided into Lower, Middle and Upper Huronian, and Keweenawan. The rocks of the Algonkian are developed on an enormous scale around the upper Great Lakes, where they comprise limestones, sandstones, quartzites, shales, slates and schists, all more or less disturbed and bearing evidence of having been subjected to metamorphism. They also include dikes and beds of igneous rocks. They contain the famous iron ore bodies of the Marquette, Mesabi and other ranges, the Michigan copper deposits, the copper and nickle of Sudbury, and much of the rich silver ore of the Cobalt district. Algonkian rocks are also known at many points in the Rocky Mountains, and sediments believed to be of equivalent age are known in Europe and other continents. The period was marked by extensive volcanism, particularly in the Keweenawan epoch, when lava flow after lava flow succeeded one another, to enormous thicknesses. At least two periods of folding also took place, one of them of mountain-making magnitude. The presence of striated bowlders in conglomerates of Lower Huronian age in Canada has led many to believe that glaciation occurred during the early Algonkian. A few fossil remains have been found in rocks of very late Algonkian age, but little is known as to the life conditions during the period.

ALGONQUIAN, or ALGONKIAN, STOCK, a North American group once comprising 40 or more separate languages, and embracing a larger area than any other on the continent, stretching in a solid block from Labrador to the Rockies and from Hudson Bay to Pamlico Sound and the Cumberland River at least, except the enclaves of Iroquois in and around New York State, and of Beothukan in Newfoundland. Outlying tribes were the Shawnee or Shawano to the south; and to the west the Cheyenne and Arapahoe, which clove their way through the heart of the Sioux across the Missouri and into the Black Hills region, and later to Colorado and Wyoming, their advance westward being checked by the Shoshone group. They numbered several hundred tribes, or "villages," entirely independent; many, in which several such villages were grouped together; and several confederacies of tribes united in a loose bond for mutual aggression or defense, though never with any real central government. The chief confederacies were the Abnaki or Abenaki of Maine and New Brunswick; the Pennacook of New Hampshire and the adjacent parts of Maine and Massachusetts; the Powhatan of Virginia and Maryland; the Illinois or Illini of that region and adjacent Wisconsin, Iowa and Missouri; the Siksika (Blackfeet, etc.) of northern Montana and adjacent Canada; the Cheyenne and Arapahoe, already mentioned; and the Sac and Fox, first at the mouth of the Ottawa, then in northern Wisconsin. (See each title). Of the individual tribes, the most important remaining were the Micmac, Amalecite, Massachusetts, Wampanoag, Narraganset, Nipmuc, Pequot, Mohegan, Mohican, Metoac and Wappinger on the North Atlantic coast; Munsi, Leni-Lenape or Dela-

ware, Shawano, Nanticoke, Conoy, Mattamuskeet, on the South Atlantic coast; Nascapi, Montagnais, Algonquin, Ottawa, Muskegon, Cree, Ojibwa, Misisaga, Miami, Piankishaw, Kickapoo, Pottawotomi, Menomini, in the interior; and Atsina in the West. Tradition places the original home of all these tribes on the North Atlantic coast.

From their being the first to come in contact with the English settlers in Canada, New England, New York, New Jersey and Virginia, and the history of English settlement for two centuries being a steady record of fierce conflict with and bloody reprisals from and on them, more is known of their minor names and those of their great chiefs — Powhatan, Opechancanough, Philip, Pontiac, Tecumseh, Black Hawk, etc.— than of any others except the Iroquois, and their languages are better studied.

Constant wars with the English, French and Dutch colonists depleted their numbers. Filled at first with the idea of freeing the soil from the whites, they afterward degenerated into mere mercenaries, fighting on either side for revenge or gain. After the War of 1812, in which they took the side of the British, the United States government resolved to send them as far west as possible. After 1840 few of them remained east of the Mississippi. In Canada they were not removed from their homes, but were limited as to territory. War and disease have thinned their number until only about 43,000 remain in the United States, and 38,000 in Canada; there are a few hundred refugees in Mexico. (See INDIANS). Consult Michelson, Truman "Classification of Algonquian Tribes" in 'Twenty-eighth Annual Report' of the Bureau of American Ethnology.

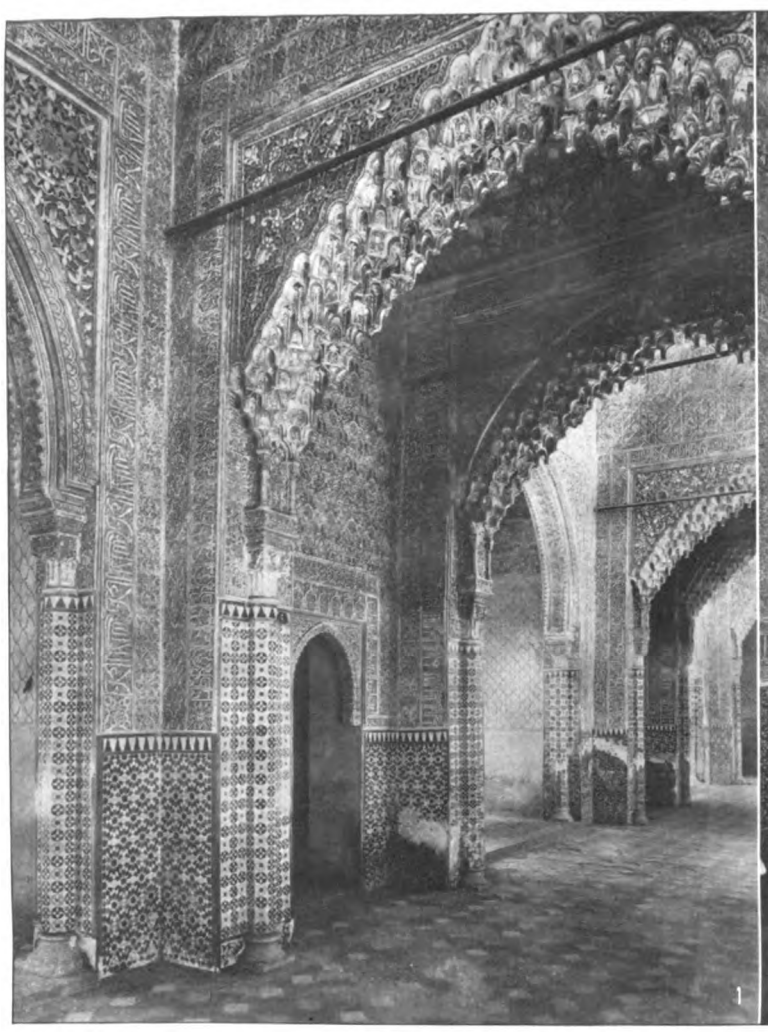
ALGONQUIN (properly **ALGOMEKIN**, "othersiders"), a once powerful Indian tribe along the Ottawa River and Lake Nipissing, Canada. Decimated by the Iroquois, some of them with other Indian waifs took refuge along the Upper Lakes and assumed the name of Ottawas (q.v.), bringing forth the greatest Indian of history, the mighty Pontiac (q.v.); others kept their name and were protected by the French in mission villages. It was French missionaries who discovered almost at their first coming that the Algonquin language was a type common to what is now called the Algonquian stock. The chief body of the remaining tribe numbers nearly 1,000, in villages of Quebec and Ontario; about 250 more are confederated with the Iroquois at Gibson, Ont., and Lake of Two Mountains, Que.

ALHAMA, ạl-ä'mạ, Spain, a town on the Motril, 25 miles southwest of the town of Granada. This place is celebrated for its warm medicinal (sulphur) baths and drinking-waters, and also for its romantic situation between craggy mountains. The principal bath was a Moorish edifice, the smaller was circular in form and probably a Roman erection. The town was thrown completely into ruins by an earthquake shock in 1884. Washington Irving, in his 'Chronicle of Granda,' gives a spirited account of the taking of Alhama, "the key of Granada," from the Moors, by Rodrigo Ponce de Leon, Marquis of Cadiz, in February 1482.

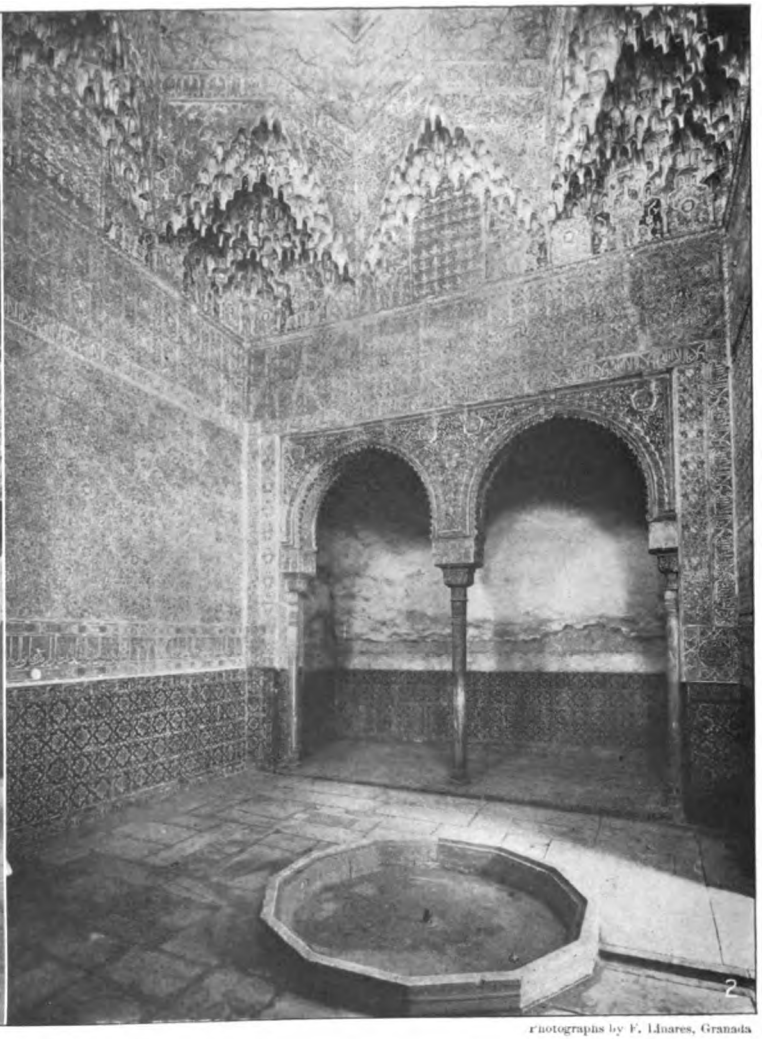
ALHAMBRA (*Kclât-al-hamrah*, the red castle), the citadel of Granada when that city was one of the principal seats of the empire of the Moors in Spain. The wall which surrounded it still stands flanked by many towers, and has a circuit of two and one-fourth miles. Within it were included several important buildings, besides dwelling-houses; but the building to which the celebrity of the site is due is the Alcazar, or royal palace of the kings of Granada, seated on the northern brow of a lofty eminence which commands a full view of the city of Granada, and, beyond it, of a charming country, bounded in the distance by a line of hills. It is a place equally interesting to the artist, the antiquarian and the historian. The erection of the greater part of the present building seems to have occupied almost the whole of the first half of the 14th century. It consists mainly of two oblong rectangular courts, the one (which was seriously damaged, if not ruined, by fire in September 1890), called the court of the Fish-pond or of the Myrtles, 138 by 74 feet, and terminating at its northern end in an apartment 35 feet square, richly ornamented; the other, called the Court of the Lions, 115 by 66 feet, and so named from the white marble fountain in the centre supported by 12 lions. An exact repetition of this court, on two-thirds of the scale of the original, was made by Mr. Owen Jones in the Crystal Palace. It is surrounded by an arcade, with small pavilions at each end, consisting of 128 columns supporting arches of the most delicate and elaborate finish, still very perfect and retaining much of their original beauty. From the character of many of the arches in various portions of the palace they are most appropriately called stalactitic. They are formed on a peculiar system with plaster bricks of various forms in a manner universally adopted in the buildings of the Moors. The construction of the arches is remarkable for its simplicity. Over the columns, which are of white marble, and which were probably gilded, are brick piers carrying rough brick arches; above these tiles are placed diagonally, forming diamond-shaped pen work, running through the thickness of the walls, and a brest-summer of timber supporting the weight above. To these rough arches are attached the various enrichments, and against the tiles are placed the perforated plaster ornaments which give a singularly light appearance to the arches, and create beautiful effects from the rays of light cast through the openings on the wall behind them. Consult Calvert, 'Granada and The Alhambra' (1900).

ALHAMBRA, Cal., city in Los Angeles County, 10 miles east of Los Angeles, on the Santa Fé, Southern Pacific and other railroads. It is a residential city with few industries. Here are located the Agnes Hill-Runkle School of Music and the San Gabriel Church, founded by the Franciscans in 1771. A religious play, similar in many respects to the Passion Play at Oberammergau, is regularly produced here. Pop. 8,000.

ALHAMBRA, Order of the, a Catholic social society or fraternity organized in Brooklyn, N. Y., in 1905. None but practical Catholics are admitted to membership, and to this end only third degree Knights of Columbus, in good standing in that order, were made eligible. The purposes of the order are the promotion of such social and intellectual inter-



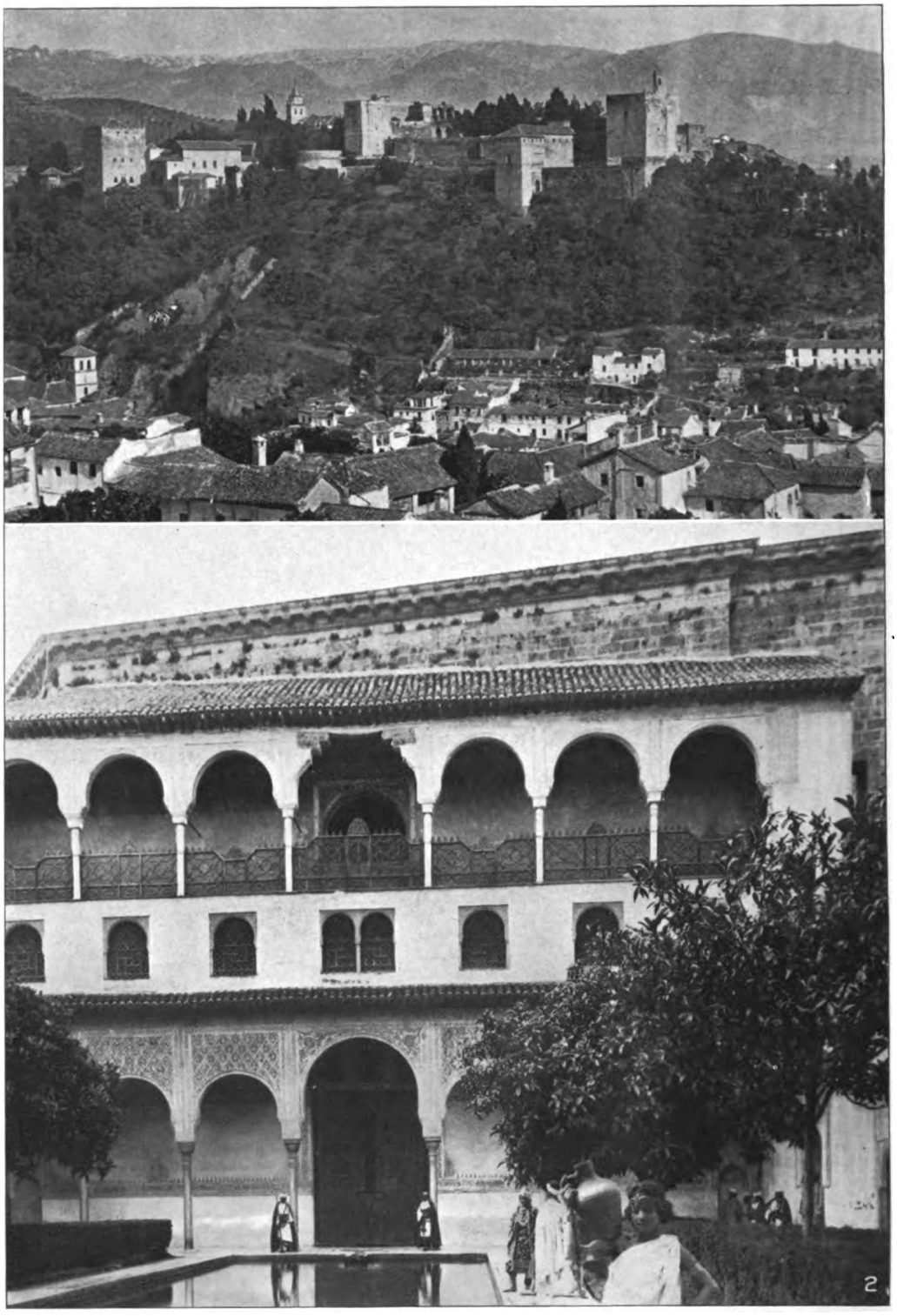
1 Angle in the Hall of Justice



2 Corner in the Hall of the Abencerrages

Photographs by F. Linares, Granada

ALHAMBRA



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1 The Alhambra at Granada, Spain

2 Court of Myrtles, Alhambra

course among its members as shall be desirable and proper and the establishment of a fund for the preservation of American Catholic historical places. The governing body of the order is the Supreme Divan, composed of the six original incorporators, the supreme officers, and the grand commander and one representative from each caravan, as the subordinate bodies are called. The Supreme Divan meets biennially in different cities, for the election of a supreme commander, vice-supreme commander, supreme scribe, supreme chamberlain, supreme captain of the bodyguard, etc. Caravans must hold at least four meetings a year in their local alcazar. The emblem of the order is the red tower of Castile surmounting the Crescent of the Saracen, typifying the triumph of Christianity over Mohammedanism. The order now has caravans in Brooklyn, N. Y.; Canton, Ohio; Boston, Mass.; Wilkes Barre, Pa.; Augusta, Ga.; Middletown, Conn.; Newark, N. J.; Jersey City, N. J.; Chicago, Ill.; Cincinnati, Ohio; New York, N. Y.; Washington, D. C.; Albany, N. Y.; New Haven, Conn.; Stamford, Conn.; Baltimore, Md.; Toledo, Ohio; San Francisco, Cal.; Elmira, N. Y.; Butte, Mont.; Portland, Ore.; Empire, Panama Canal Zone and Milwaukee, Wis.

ALHAMBRA, The, by Washington Irving (1832. Revised, enlarged, and rearranged, 1852). This Spanish Sketch-Book grew out of the experiences and studies of Irving while an actual resident in the old royal palace of the Moors at Granada. Many of the 40 sketches have their foundation only in the author's fancy, but others are veritable history.

ALI, ä'lē, cousin and son-in-law of Mohammed, the first of his converts, and the bravest and most faithful of his adherents; b. 602; d. 661. He married Fatima, the daughter of the prophet, but after the death of Mohammed (632) his claims to the caliphate were set aside in favor successively of Abu-Bekr, Omar and Othman. On the assassination of Othman, in 656 A.D., he became caliph, and after a series of struggles with his opponents, including Ayesha, widow of Mohammed, finally lost his life by assassination at Kufa. A Mohammedan schism arose after his death, and has produced two sects. One sect, called the Shiites, put Ali on a level with Mohammed, and do not acknowledge the three caliphs who preceded Ali. They are regarded as heretics by the other sect, called Sunnites. The Maxims and Hymns of Ali are yet extant. See CALIPH.

ALI, pasha of Yanina, commonly styled ALI PASHA, a bold and able, but ferocious and utterly unscrupulous, Albanian: b. 1741, son of an Albanian chief who was deprived of his territories by rapacious neighbors. By his enterprise and success and entire want of scruple he got possession of more than his father had lost, making himself master of a large part of Albania, including Yanina, which the Porte sanctioned his holding, with the title of pasha. As a ruler he displayed excellent qualities, putting an end to brigandage and anarchy, making roads, and encouraging commerce. He extended his sway by subduing the brave Suliotes of Epirus, whom he conquered in 1803 after a three years' war. Aiming at independent sovereignty, he intrigued alternately with England, France and Russia. Latterly he was almost independent of the Porte, which at length determined to put an end to his power; and in 1820 Sultan Mahmoud pronounced his deposition. Ali resisted several pashas who were sent to carry out this decision, only surrendering at last in 1822 on receiving assurances that life and property should be granted him. Faith was not kept with him, however; he was killed and his head cut off and conveyed to Constantinople, while his treasures were seized by the Porte.

ALI BABA, the principal figure in the famous 'Arabian Nights' Entertainments' tale of 'Ali Baba and the Forty Thieves.' He overhears the thieves opening the door of their cavern by the use of the magic words "Open sesame." He does the same in their absence and appropriates as much of their wealth as he can carry. Cassim, his brother, enters the cave later, but having forgotten the magic word is presently found by the robbers and killed. They make an attempt to slay Ali Baba, but are defeated by the slave Morgiana, who pours boiling oil in the jars in which the robbers are hidden.

ALI BEY, Egyptian ruler: b. in the Caucasus in 1728, was taken to Cairo and sold as a slave, but having entered the force of the Mamelukes and attained the first dignity among them, he succeeded in making himself virtually governor of Egypt. He now refused the customary tribute to the Porte and coined money in his own name. In 1769 he took advantage of a war in which the Porte was then engaged with Russia, to endeavor to add Syria and Palestine to his Egyptian dominion, and in this he had almost succeeded when the defection of his own adopted son Mohammed Bey drove him from Egypt. Joining his ally Sheikh Daher in Syria, he still pursued his plans of conquest with remarkable success, till in 1773 he was induced to make the attempt to recover Egypt with insufficient means. In a battle near Cairo his army was completely defeated and he himself taken prisoner, dying a few days afterward either of his wounds or by poison.

ALI FERROUGH BEY, ä'lē-fĕr'rō-bā', Turkish diplomatist: b. Constantinople 1865. After serving as secretary of embassy at Paris, London and Bucharest, as well as councillor of embassy at St. Petersburg, he was promoted to the post of minister-plenipotentiary and envoy-extraordinary to the United States. Besides histories of Arabia and Turkey he has published 'Public and Private International Law.' In 1901 he was recalled from his post at Washington.

ALIAGA, ä'lē-ä'gą, Philippines, town of Luzon, province of Nueva Ecija, 70 miles northwest of Manila. Situated in a fertile valley between the Pampanga Chico and the Pampanga Grande rivers; the inhabitants engage in the cultivation of rice, tobacco, sugar cane and corn. Pop. 12,000.

ALIAS, in law, a term used to indicate the names under which a person who attempts to conceal his true name is ascertained to have passed during the successive stages of his career. An alias writ is a writ issued where one of the same kind has been issued before in the same cause.

ALIBI, in law, a plea that the person accused of having committed a crime was else-

where at the time when the breach of the law occurred. If he substantiate this, he is said to prove an alibi. In Scotland the defendant must give notice of a special defense of alibi, stating where he was when the crime was committed. In England and the United States this notice is not required. If the accused can make it appear that at the time when the crime charged is alleged to have been committed (it being of a nature to require his personal presence) he was in another place, his innocence will be established, because of the obvious impossibility of the same person being in two places at once. This species of defense is constantly resorted to in trials for crime. One of the principal rules in the application of this species of evidence is that the time relied on, and in which the value of the evidence mainly consists, must correspond closely with the time at or during which the offense is proved to have been committed. If, time having been fixed to a particular day, hour and minute, the person accused can show that at that exact time he was in another place, his innocence is at once made apparent.

ALICANTE, Spain, a seaport and capital of the province of Alicante; the ancient Lucentum. It is situated at the foot of a cliff 850 feet high, crowned by the fort of Santa Barbara. It has one of the best harbors on the Mediterranean and carries on a considerable trade, exporting wine, fruit, esparto grass, etc. It was bombarded in 1873 by two vessels sent out by Cartagena insurgents. Professor Freeman, the English historian, died here in 1892. An American consul has been stationed at Alicante for some years. Pop. 52,000.

ALICATA, ą-lē-kā'tą, or **LICATA,** lē-kā'tą, Sicily, the most important commercial town on the south coast, at the mouth of the Salso, 24 miles east southeast of Girgenti, with a considerable trade in sulphur, grain, wine, oil, nuts, almonds and soda. It occupies the site of the town which the tyrant Phintias of Acrogas erected and named after himself when Gela was destroyed in 280. Pop. 16,000.

ALICE'S ADVENTURES IN WONDERLAND (published 1865), by Charles Lutwidge Dodgson ("LEWIS CARROLL") grew out of a story which the author told the three little daughters of Dean Liddell — one of them the original Alice — while boating on the Thames near Oxford. Its success led him to write 'Through the Looking Glass and What Alice Found There' (1871). Both are dream tales of exquisite nonsense. The earlier is the looser and more desultory, matching the incoherence of dreams and the inconsequential narrative processes of a child's mind; it is generally thought to be preferred by children. The later story has a definite structure, following the moves of a chess-problem; it reiterates, however lightly, that

> "We are such stuff
> As dreams are made on;"

and it employs frequently the *motif* of topsy-turvydom,— everything in Looking Glass Land being, of course, the reverse of ordinary experience. Though 'Wonderland,' like 'The Looking Glass,' appeals strongly to adults as well as to children, yet 'The Looking Glass,' by reason of the traits just noted, is to the mature mind more openly suggestive of philosophy and satire. In the Red Queen's topsy-turvey remark, "Now here, you see, it takes all the running you can do to keep in the same place," children see only admirable fooling, while their elders perceive, besides, a keen paradox upon the hustling society of to-day.

In the range of this double appeal there is little to choose between the books. 'Wonderland' excels, perhaps, in invention of personages and incidents — the Duchess, the Cheshire Cat, the Mock-Turtle, the Mad Tea-Party, the Lobster Quadrille, and the Trial — the last often cited as an anticipation of the Dreyfus affair. 'The Looking Glass' probably excels in the richer and more sustained nonsense of its verses — 'Jabberwocky,' 'The Walrus and the Carpenter,' 'I Sent a Message to the Fish,' and 'Haddock's Eyes'; but it can match its White Knight and Humpty-Dumpty against any of the characters in 'Wonderland.' Both books abound in parody; the present generation may need a reminder that Father William first belonged to Southey, and that Wordsworth's Leech Gatherer is the original of the Old Man on the Gate. Both books abound in puns and verbal quips; the curriculum of Reeling and Writhing, Laughing and Grief, Drawling, Stretching, and Fainting in Coils, and the revised proverb "Take care of the sense, and the sounds will take care of themselves" ('Wonderland') are household words; while human speech in general is the richer by *galumphing, frumious, frabjous, uffish, chortle,* and the other "portmanteau words" of 'The Looking Glass.'

Though each volume thus has its excellences, the two merge in memory into a single 'Alice.' The illustrations by John Tenniel have made the "hard words" and the strange creatures real; no artist ever shared more fully with an author the labor and the success of creation. 'Alice' has been dramatized and has been translated into French and German — 'Jabberwocky' into Latin elegiacs as well. Growing out of the author's delight in telling stories to children, 'Alice' has remained to delight all the young in heart, has placed the "sense of nonsense" second only to the sense of humor and has added permanently to the gaiety of nations. Consult Collingwood, Stuart Dodgson, 'Life and Letters of Lewis Carroll' (London and New York 1889).

SAMUEL L. WOLFF,
Instructor in English (Extension Teaching), Columbia University.

ALIEN. See ALIENS.

ALIEN AND SEDITION ACTS, in American political history, four acts passed by the Federalist party in Congress in the summer of 1798, under John Adams, which were the immediate cause of the first nullification proceedings in the South (see KENTUCKY RESOLUTIONS; NULLIFICATION; VIRGINIA RESOLUTIONS) and one of the causes which alienated enough votes from the Federalists to drive them out of power sooner than was inevitable. (For the genesis of the alien acts see also AMERICAN PARTY). The embittered exiles who flocked here from 1790 on were doubly obnoxious to the Federalists; both as scurrilously offensive journalists, oftentimes, and as hostile to all attempts to punish France for her wanton aggressions on American commerce. In 1797

the House was Republican, the Senate Federalist; the latter attempted to pass measures for defense against France, which the former steadily voted down. At length, in 1798, the publication of the "X. Y. Z." correspondence, showing the rottenness of the French Directory, shamed the defenders of France and incensed the moderates into supporting the Federalists, who, having now a majority in both houses, first enacted three laws concerning aliens; (1) 18 June, making the residence before naturalization 14 years instead of five and the under penalties, and entry on such register the only proof admitted on applying for naturalterm after declaration of intentions five instead of three; alien enemies not to be allowed naturalization; registration of all aliens on arrival, ization. (2) 25 June, empowering the President for two years to order out of the country any aliens he thought dangerous or engaged in conspiracies. (3) 6 July, legalizing the apprehension or deportation of all resident aliens when war was declared against the United States. These acts were denounced by the Republicans on three grounds, two of State rights and one general, as invading the constitutional rights of the States to permit such immigration as they chose up to 1808 (really intended to apply only to slaves); that it assumed national powers over persons under the jurisdiction of their States; and that it violated the right of trial by jury. It was on these points that Jefferson and Madison drew up the Kentucky and Virginia legislative resolutions, the former of which, on its repetition in 1799, named nullification as the proper remedy. Second, on 26 June, Lloyd of Maryland introduced a bill (1) declaring France an enemy of the United States and any one who should uphold her or give her aid or comfort guilty of high treason; (2) defining treason; (3) imposing $5,000 fine and six months' to five years' imprisonment on any one conspiring to oppose or impede United States measures, intimidate United States officers, stir up insurrection, etc.; (4) imposing a fine of not over $2,000 and imprisonment for not over two years for any utterance or writing tending to justify France or to defame United States officials as hostile to popular liberties, etc. It passed the Senate by a heavy majority; the House made important changes in it and passed the altered bill by a scratch. These changes were: (1) Canceling the first two sections altogether; (2) substituting for the fourth, the publishing or printing any false, scandalous or malicious writings to bring the government, Congress or President into contempt or disrepute, excite popular hostility to them, incite resistance to United States laws or encourage hostile designs against the United States, etc. To these, which gave Federal judges power to make any opposition to the ruling party a felony, Bayard of Delaware got two clauses added which drew their teeth: the first making the truth a good defense and juries the judges of the fact; the second restricting the term of operation to 4 March 1801 — that is, till a new administration came in, so that it should expire with the Federalists if they went out and the Republicans thus lose the *éclat* of repealing it. It would naturally be supposed that the Alien Acts, which affected only a few foreigners and no internal liberties, and which as a fact remained entirely unenforced, would have caused little commotion in the Republican party; and that the Sedition Act, which struck at all liberty of free speech or publication, and was contrary to the very basis of free government, and under which at least six prosecutions and most scandalous performances of one Federal judge took place, would have provoked almost a civil war. The facts are an instructive historical lesson against transferring the ideas of one age to another. The Republicans disliked the use of prosecutions under the Sedition Act as a party weapon and resented Judge Chase's partisan decisions; but it was only as directed against themselves, not as against civil liberty, that they reprobated it,— neither party had attained to that ideal,— and their chief rhetoric and defiance was directed against the harmless acts which tried to prevent their supporting France. It was in crystallizing the spirit of State resistance to national power that the acts have their main importance.

ALIEN PRIORIES, the name given to cells or houses erected on the lands belonging to various great religious houses on the Continent before the Conquest. Certain people were appointed to livings on these lands. Schools were maintained at the priories which grew to be important factors in the mediæval system of elementary education. They were finally suppressed in 1415 by Henry V, when 146 alien priories disappeared. The King had intended to use this property as an endowment of a college at Oxford, but his death prevented this; and Henry VI gave some of the property to Eton, Windsor and King's College, Cambridge. The bulk of the lands was appropriated for private use. Consult Tanner, 'Notitia' (1744) and 'Some Account of the Alien Priories' (1786), which contains a list of lands devoted to educational uses.

ALIENATION OF ESTATES, comprises any method whereby estates are voluntarily resigned by one and accepted by another, whether that be effected by sale, gift, marriage settlement, devise or other transmission of property by the mutual consent of the parties. 2 Bl. Com., § 287; 55 N. J. L. 417. The term alienation is particularly applied to absolute conveyances of real property. 1 N. Y. 290, 294. Alienations by deed may be by conveyances at common law; which are either original or primary, being those by means of which the benefit or estate is created or first arises; or derivative or secondary conveyances, being those by which the benefit or estate originally created is enlarged, restrained, transferred or extinguished; or they may be by conveyances under the statute of uses. The original conveyances are the following: Feoffment, gift, grant, lease, exchange, partition. The derivative is release, confirmation, surrender, assignment, defeasance. Those deriving their force from the statute of uses are covenants to stand seized to uses, bargain and sale, lease and release, deeds to lead or declare the uses of other more direct conveyances, deeds or revocation of uses. 2 Bl. Com. ch. 20; 2 Washb. Real Prop. 600.

ALIENIST. See PSYCHIATRY.

ALIENS, āl'yĕnz. An alien is any person to whom the rights of citizenship have not been granted by the State in which he resides or so-

journs. Though subject to the jurisdiction of the State, and in a sense clothed with its national character, if domiciled therein, aliens are not, in a political sense, members of the State. A distinction is made between domiciled aliens or those who have established a residence or a house of trade in the State and temporary sojourners. Again a distinction is made between alien friends and alien enemies, the latter of whom are subjects of a hostile state. In time of war alien enemies are placed under special restrictions and disabilities to which other aliens are not subject. Thus they are frequently denied the privilege of bringing actions in the courts; sometimes their houses of trade are placed under sequestration; during the European War of 1914–17 they were in several belligerent countries interned in concentration camps and sometimes they are even expelled in a body as the Italians were from Turkey during the Turco-Italian War of 1911–12, and as the Japanese were from Manchuria during the Russo-Japanese War in 1904.

Although politically members of a foreign state aliens are nevertheless subject to the local jurisdiction; they are held to owe the State in which they reside a local and temporary allegiance and of course they are bound to obey the laws equally with citizens. It has even been held that they may be prosecuted for treason against the State in which they are domiciled (Carlisle v. The United States, 16 Wall. 147). They are not only bound to obey the local laws, but they may be required to share in the public burdens equally with citizens. It has been held in the United States that they may be called on to aid in the local defense, although they are not liable to conscription in the regular army. But during the Civil War all aliens who had declared their intention of becoming citizens of the United States, and who had exercised any political franchise were declared to be subject to the terms of the Draft Act, unless they left the country within 65 days. Being subject to certain obligations and duties aliens are equally entitled to certain rights and privileges, the most important of which is the right to protection in their persons and property. Most countries, in fact, make no distinction between aliens and citizens so far as the enjoyment of *civil* rights is concerned; but everywhere they are subject to disabilities in respect to *political* privileges. They are generally excluded from the privilege of voting and holding office, although in a number of American States they may vote and probably also hold office, if they have declared their intention of becoming citizens. See NATIONALITY.

By an act of Congress of 2 March 1907, they are entitled to a passport, valid for six months, and carrying with it the right of protection by the United States government provided they have declared their intention of becoming citizens and have resided in the United States for a period of three years.

If they sustain injuries in consequence of riot, mob violence or insurrection they are in the same position as citizens, but the principle now seems established that if they have suffered injuries from attacks on account of their nationality the United States government is under an obligation to indemnify them or their families, especially if the local authorities were remiss in affording them protection. It is true that the United States government has uniformly denied such liability, but in most instances it has in fact paid an indemnity in such cases.

Under the common law, aliens were once subject to many civil as well as political disabilities, but most of their civil disabilities have been removed by legislation. Thus at common law an alien could not take real property by descent, although he might acquire it by purchase or gift, but this disability was removed in England by an act of Parliament in 1870 and it has been removed by act of the legislature in most of the American States. In most of them, an alien may now acquire, own and convey land equally with citizens, though in a few States the common-law disability still remains. Some States make a distinction between resident and non-resident aliens, allowing the former, but excluding the latter, from owning real property; others make a similar distinction between aliens who have declared their intention of becoming citizens and those who have not. In the Territories, the District of Columbia and other places subject to the jurisdiction of the United States the ownership of lands is regulated by act of Congress, and Congress has enacted that no alien or foreign corporation shall be allowed to own or hold land in the District of Columbia, and that no alien who has not declared his intention to become a citizen of the United States may own land in any of the Territories unless the right has been granted by treaty.

Where treaties have been concluded with foreign countries, allowing their citizens or subjects to hold land in the United States the Supreme Court has uniformly held that the treaty right is paramount to any State law to the contrary, notwithstanding the general right of the States, under their reserved powers, to regulate the ownership and disposition of property within their limit (Chirac v. Chirac, 2 Wheat. 249). There is, however, doubt as to how far the States may go in forbidding the employment of alien labor when their legislation conflicts with a treaty between the United States and the country of which the alien affected is a subject. But it has recently been held by the Court of Appeals of New York that a statute of New York forbidding the employment of aliens on the public works of the State was contrary to a treaty between the United States and Italy, providing that Italian subjects residing in the United States should enjoy the same rights and privileges as citizens of the United States, and was, therefore, null and void so far as it affected Italian laborers. The case is now (1917) before the Supreme Court of the United States for final determination. Pennsylvania, Massachusetts, New Jersey, Arizona, Wyoming, Idaho and California have similar laws on their statute books. The question whether a State may prohibit or restrict the employment of aliens in private as well as public work was definitely disposed of by the Supreme Court of the United States in 1915. The legislature of Arizona had passed an act forbidding the employment in any work, public or private, of more than 20 per cent of alien labor. The governments of Great Britain and Italy protested that the statute was in con-

travention of treaties with the United States and the Supreme Court so held and declared the statute null and void.

The sovereign right of every government to prohibit or restrict the admission of aliens to its territory, so far as it is not contrary to treaty stipulations, is well established. As is well known, the United States has exercised the power of total exclusion in the case of the Chinese and of various classes on the ground of the public safety, health or morals, and has imposed severe and numerous restrictions upon the coming of aliens generally. See IMMIGRATION.

Flowing from the same right of sovereignty is the right of expulsion in the interest of self-protection. In earlier times this right was resorted to much more commonly than now. Except in times of war, when even then it is rarely exercised, the power of expulsion is only resorted to in the case of dangerous or otherwise highly objectionable individuals. In any case it should not be exercised in an arbitrary manner without good cause, otherwise the government of which the victim is a subject may justly prefer a claim for violation of what is generally admitted to be a well-settled right of aliens under international law. The individual expelled should be informed of the charge against him, and be given an opportunity to answer, and if he is a domiciled alien he should be given a reasonable time to dispose of his property or wind up his business before leaving. In Europe and Latin America expulsion is generally an administrative act, but in the United States the President has no such power, except as commander-in-chief of the army and during war. In time of peace he could probably exercise such power only in pursuance of an act of Congress. Between 1798 and 1800, when the Alien and Sedition Acts were in force, the President possessed such power, but there was a strong popular opposition to the law, and they were speedily repealed after having been in existence two years. See also ALLEGIANCE; CITIZENSHIP IN THE UNITED STATES; IMMIGRATION; NATIONALITY; NATURALIZATION AND NATURALIZATION LAWS; SUFFRAGE.

Bibliography.— The authorities cited at the end of the article on CITIZENSHIP IN THE UNITED STATES.

JAMES W. GARNER,
Professor of Political Science, University of Illinois.

ALIENS IN WARTIME. The treatment of enemy aliens in different countries at war is a problem which has to be handled firmly, each country deciding the question for itself, and being guided by self-interest, and also by enemy behavior. In ancient times, enemy aliens were killed; civilization brought detention, arrest and even toleration of well-behaved enemies. The method of dealing with a hostile alien population in a nation, when a state of war exists, is essentially a military question, to be settled by military authorities. Wholesale interment is objectionable, costly, and diverts necessary guards from the military service. The most satisfactory solution is wholesale and immediate repatriation. The objections are the difficulty of transportation and the repatriation of males of military age. The former can be solved, and the addition of a battalion of men of military age is not a great advantage, and would be compensated by the release of guards. At the beginning of the European War in 1914, the problem for Great Britian and German differed, because there were only 5,300 British subjects detained in Germany, while there were 27,200 Germans of military age in Great Britain alone, besides the great number of German aliens in the overseas possessions. No satisfactory basis of exchange was discovered. After the severing of diplomatic relations with Germany in 1917, a bill was introduced into the United States Congress 25 July 1917, to return aliens of draft age to their home countries.

ALIGARH, ä'lē'gär, or **ALIGHUR,** India, a town in the northwest provinces, capital of the executive district of the same name, 53 miles north of Agra. Aligarh was merely a fortress, the town being Koil, distant about two miles and connected with Aligarh by a beautiful avenue. It was formerly of importance and was one of Dowlet Rao Sindia's principal depots for military stores. The fort was taken in 1803 by Lord Lake, Sindia's commander, Perron (a Frenchman) having previously surrendered, and the whole district was then added to the British possessions. Since that time the fort has been much improved, and the town renamed Aligarh has become the station of a civil and judicial establishment and a prosperous industrial and trading centre. Pop. 64,800.

ALIMENT. See FOOD; NUTRITION.

ALIMENTARY TRACT, or **GASTRO-INTESTINAL TRACT,** is the whole digestive tract in animals concerned in the processes of digestion and nutrition. It is in man a highly developed and differentiated tube or canal from 25 to 30 feet in length extending from the mouth to its posterior end, the anus. The mouth opens into the pharynx and this in turn into the esophagus, a muscular tube leading into the stomach. This is a dilated and pouchlike portion of the canal. From the stomach the tube is narrowed into the small intestine, which occupies from 22 to 25 feet in length and is divided into three parts histologically distinguished from each other. These divisions are the duodenum, jejunum and ileum. The ileum opens at its termination into a blind sac, the cecum, which extends down some two or three inches from the juncture and from the posterior left surface of which the appendix vermiformis is given off. The ascending colon, the first division of the large intestine, begins here and passes up the right side of the abdomen, crosses over under the liver high up in the abdomen, about at the level of the umbilicus, constituting the transverse colon. This turns at the left into the descending colon which passes down in front of the left posterior abdominal wall, continues into the iliac colon which in turn extends to the pelvic colon. This forms a loop in the true pelvis and at its distal end it turns sharply downward to form the rectum which bends with a forward concavity and ends in a dilatation which terminates in the anal canal, the final termination of the alimentary tract. This

is about an inch in length and is guarded at its external opening by two circular muscles known as the sphincters.

The number of accessory glands and organs that empty their secretions into the alimentary tract is very great. The most important are the salivary glands in the mouth, the secretory glands of the stomach, the liver and pancreas, the secretions of which enter by a common duct just below the stomach, and the secretory glands of the intestines.

The structure of the different portions of the tube is similar, but variations in function produce some modifications in the muscular coats. In general there is a layer of mucous membrane on the interior of the canal; this is surrounded by a supporting framework of connective tissue, and is further strengthened by a varying amount of unstriped muscular tissue. For details of structure see INTESTINE; STOMACH. For the more complicated chemical processes of digestion, the work of the alimentary tract, see DIGESTION; METABOLISM; NUTRITION.

ALIMONY, in law, the allowance awarded out of her husband's estate, to which a wife is entitled on separation or divorce. Jurisdiction in this matter in England rested with the ecclesiastical court until 1857, when it was conferred upon a court of divorce. In the United States it is vested in the courts of equity. Alimony may be granted by the court during litigation, in which case it is known as *pendente lite* (during the suit); or at the conclusion of the suit, when it is called permanent. The former enables the wife to pursue the litigation, whether proceedings have been brought by or against her. The amount granted lies within the discretion of the court and depends upon a variety of considerations, and is governed by no fixed rules. The ability of the husband to pay is of most importance in determining the amount, and in estimating his ability his entire income will be taken into consideration, whether derived from his property or his personal exertions. So far as any general rule can be drawn from the decisions and practice of the courts, the proportion of the joint income to be awarded for permanent alimony is said to range from one-half to one-third, while in case of alimony pending suit it is not usual to allow more than one-fifth, and usually a smaller proportion will be allowed out of a large estate than out of a small one. Permanent alimony is a periodical allowance awarded to the wife if the termination of the suit is favorable to her. By a writ of *ne exeat* (let him not depart) the court can prevent the husband from leaving the State without leaving sufficient security for payment. The writ of *ne exeat* has been expressly abolished in many of the States of the Union, but its place has been filled in almost every instance by a similar procedure. In New York a system of arrest and bail has been substituted for the writ. If the husband should remove to another State the wife can enforce her claim in the Federal courts. See MARRIAGE AND DIVORCE.

ALIN, ä'lin, **Oscar Josef**, Swedish historian and statesman: b. Falun, 22 Dec. 1846; d. Upsala, 31 Dec. 1900. In 1882 he was appointed professor of political economy at Upsala University and later rector. In 1888 he became a leading member in the first chamber of the Riksdag. His fame rests on his historical works, chief of which are 'Bidrag till svenska radets historia under medeltiden' (Upsala 1872); 'Sveriges Historia, 1511–1611' (Stockholm 1884–87); 'Den svensk-norsk Uniomen' (Stockholm 1889–91).

ALISMACEÆ, the water-plantain family. *Sagittaria* (arrowhead). See ARROWHEAD; WATER PLANTAIN.

ALIZARIN (from *alizari*, the commercial name of madder in the East), a substance having the formula $C_{14}H_6O_2.(OH)_2$, formerly obtained from the root of the madder (*Rubia tinctoria*), but now artificially produced from coal-tar and the refuse from the distillation of crude petroleum. It is used as a dye, for producing the color known as "turkey red." Alizarin is of interest to the chemist not only on account of its industrial importance, but also because it was the first vegetable coloring matter to be produced artificially; and the year 1868, in which its synthesis was effected by W. H. Perkin, therefore marks the beginning of a new era in industrial chemistry. In the manufacture of alizarin, anthracene ($C_{14}H_{10}$) is first prepared from coal-tar, and by oxidation (which it readily undergoes under the influence of potassium bichromate or other oxidizing agent) is transformed into anthraquinone, $C_{14}H_8O_2$. The next step is to sulphonate the substance so formed. Anthraquinone is remarkably stable toward sulphuric acid, but combination can be effected by strongly heating a mixture of the two, and a solution of mono- and disulphonic acids of anthraquinone is the result. The excess of sulphuric acid is then removed, and the sulphonic acids are heated with caustic potash to about 350° F. The mass gradually darkens till it becomes almost black, at which stage it dissolves in water with the formation of a rich purple solution, from which alizarin can be precipitated in abundance by the addition of sulphuric acid. A similar process was also devised by Perkin, in which the first step is the formation of dichloranthracene, $C_{14}H_8Cl_2$, by treating anthracene with chlorine. Subsequent treatment of this body with sulphuric acid gives anthraquinone disulphonic acid, $C_{14}H_6O_2(HSO_3)_2$. This is fused with potash, as described above, and the alizarin precipitated with sulphuric acid as before. Anthrapurpurin is formed, simultaneously with alizarin, in the processes given above. Its behavior as a dye is similar to that of alizarin, but it gives a brighter red. Pure alizarin, as obtained by sublimation, crystallizes in yellowish-red crystals, only slightly soluble in alcohol or water, but readily dissolving in alkalis. Chemically, alizarin is known as dioxyanthraquinone.

ALKAHEST, The, or THE HOUSE OF CLAËS (*'La Recherche de l'Absolu'* — The Search for the Absolute), is a striking novel by Honoré de Balzac. The central character, Balthazar Claës, is a wealthy chemist, the dream of whose life is to solve the mystery of matter. Gradually the quest becomes a fixed idea, for which money, family, health, sanity, are sacrificed, and Claës dies heart-broken and defeated. As foils to him stand his devoted wife and his eldest daughter Marguerite, noble women, the latter one of the finest creations of Balzac's genius. They sympathize sorrowfully yet tenderly with his ideal, and bear with true heroism the misery to which his mad course subjects

them. The story belongs to that series of the Human Comedy known as "Philosophical Studies," and appeared in 1834.

ALKALI (from the Arabic, *al*, "the," and *qaliy*, "ashes"), a term originally used for the soluble part of "pot-ashes," but since extended to include the hydrate or oxide of any of the metals lithium, sodium, potassium, cæsium and rubidium, or of the radical ammonium. The alkalis possess strongly basic properties, and (with the exception of ammonia) rapidly absorb carbon dioxide from the air, when moist, passing into the form of carbonates. They are all soluble in water, and nearly all of their compounds are also soluble. The real nature of the alkalis was first conclusively proved by Sir Humphrey Davy when in 1807 he decomposed potash and soda by means of the electric current. Alkalis in concentrated solution exert a powerfully corrosive action on the skin, and even in very dilute solution they alter the color of certain vegetable infusions very markedly. This property is utilized for detecting free alkalis in solutions under examination, strips of bibulous paper impregnated with red infusion of litmus being moistened with the fluid to be tested. An exceedingly small amount of free alkali will transform the red color to a blue. The alkali metals are all monovalent. The early chemist distinguished another class of substances, somewhat resembling the alkalis, as the "alkaline earths." These include the oxides of calcium, strontium and barium. The alkaline earths are basic in nature, and differ from the alkalis chiefly in being less soluble. Magnesium is sometimes included among the alkaline earths, but it falls more naturally into the zinc group. See SOILS.

ALKALIMETRY, that branch of chemistry which treats of the quantitative estimation of alkalis present in a given solution. See ANALYSIS, CHEMICAL.

ALKALOIDS, organic bases, forming definite salts with acids and resembling in some respects the metals of the alkalis, hence the name. A number of basic nitrogenous compounds of marked physiological action and somewhat analogous in their chemical composition. It has been proposed to limit the word alkaloid to the group of basic nitrogenous principles found in plants, the somewhat similar bodies found in animals being termed ptomaines (q.v.) and leucomaines (q.v.). (See ANIMAL ALKALOIDS). Some even class as alkaloids a series of feebly basic compounds prepared synthetically from the anilines, antipyrine, etc. We shall here consider only such alkaloids as are basic nitrogenous principles, products of the metabolism of plants.

Distribution.— Alkaloids are widely distributed throughout the plant kingdom; many plants contain them, and some plants contain a large number; opium, *Papaver somniferum*, for instance, contains a dozen or more alkaloids. The *Cinchona* family also contains many. In such cases, however, the alkaloids are, as a rule, very closely related in their chemical structure. Certain plant families contain many, others a few or none. Most of the alkaloids are found in the Dicotyledons, a few only are found in the Monocotyledons, Colchicum, and perhaps some of the *Liliaceæ*. The fungus *Amanita muscaria* contains the deadly alkaloid muscarine (q.v.). The *Papaveraceæ*, *Solanaceæ* and *Ranunculaceæ* are particularly rich in alkaloids. The *Leguminoseæ*, *Rubiaceæ*, and *Umbelliferæ* contain many, while the large families of the *Compositæ* and *Labiateæ* contain very few. For the most part similar alkaloids are found in related plants, yet a few widely separated plants contain similar alkaloids, berberin being an example. As to their location in the plants themselves, alkaloids are found mostly in the fruit and seeds; many are found in the barks, and some in the roots. They are formed for the most part in the actively growing portions of the plant and are probably katabolic products of the plant metabolism. They are usually found in solutions combined with some plant acid in the cell sap, sometimes dissolved in oils or mucilage, and in many instances are stored up in secretory passages in the plant. As to the rôle that the alkaloids play in the plant economy it is difficult to state positively. They do not seem to be utilized by the plant as a source of energy and in some instances are even poisonous to the plant itself. One of the services they perform for the plant is to aid it in the struggle for existence by being poisonous to animals. The large quantities found in seeds is evidence of the support of this view.

For the most part alkaloids are solid, nonvolatile, crystalline bodies, a few being liquid and volatile, such as arecoline, nicotine, coniine, spartein. The former contain carbon, hydrogen, nitrogen and oxygen. The three latter liquid alkaloids contain no oxygen and have a marked odor; the solid alkaloids possess no odor. With few exceptions the alkaloids are insoluble (or soluble with great difficulty) in water.

Chemically the alkaloids are divisible into five provisional groups, although it was at one time held that only those bodies belonging to the Pyridine group should be considered as alkaloids. These groups as classed by Brühl are (1) the Pyrrolidine group — containing an alkaloid from the coca leaf, hygrine; (2) the Pyridine group, which contains a large number, pilocarpine, pilocarpidine, arecoline, arecaine, coniine, conydrine, piperine, nicotine, atropine, hyoscamine, cocaine, pelletereine, sparteine, cystisine and others; (3) Quinoline group — containing cinchonine, quinine, cinchonidine, strychnine, brucine, curarine, and others; (4) Ison group — containing the opium alkaloids, morphine, papaverine, narcotine, codeine, thebaine, hydrocotarnine, hydrastine, cannabine, berberine, corydaline; (5) alkaloids of undetermined relationship, a few only being of other than chemical interest, ergotinine, colchicine, veratrine, cevadine, jervine, rubijervine, aspidospermine, yohimbine, anhalonine, lupinine, gelsemine, aconitine, pseudoaconitine, japaconitine, delphinine, emetine, etc. However, many alkaloids, the structure of which is well known, such as caffeine, theobromine, muscarine, etc., do not fit into this scheme.

The internal chemical construction of all the alkaloids is extremely complex; for many it is unknown. Most are tertiary bases; a few are similar to the secondary amines in structure. Ammonia bases are also present in many. Many alkaloids acted on by strong alkalis are broken up into two components, a basic body and a nitrogen free, usually aromatic acid. Most of the alkaloids react similarly to oxidiz-

ing agents; nitric acid, chromic acid, potassium ferrocyanide and potassium permanganate are the most active. The last makes an efficient chemical antidote for many of them. A few alkaloids have been made synthetically. In the making, however, a related base has been necessary.

Physiologically the alkaloids are for the most part very active. Some have very little action, berberine, for example, while aconitine is one of the most toxic of substances. Nearly all of them have a marked affinity for nerve structures, on which a few have markedly poisonous action: some of them attacking the sensory nervous elements more particularly (aconitine, cocaine); others exerting their greatest activity on the motor nervous structures, sometimes in the muscle plates (coniine, curarine) causing paralysis; others in the motor cells in the anterior horn of the spinal cord (strychnine). Still others exert their influence on the nerve cells of the brain (morphine, hyoscyamine).

History.— The history of the discovery of the alkaloids is about 100 years old. Derosne of Paris first isolated from opium in 1803 a salt "of opium," as he termed it. This was a mixture of morphine and narcotine, and in 1806 Sertürner, a pharmacist of Hanover, first definitely discovered morphine. It was not until 1817, however, that the discovery was noticed. Following this in rapid succession different alkaloids were isolated — narcotine and emetine, in 1817, veratrine and strychnine, in 1818, brucine and piperine, in 1819, caffeine, cinchonine and quinine, in 1820, and by 1835 at least 30 alkaloids were known. At the present time there are more than 200 known, and new ones are being discovered rapidly; detailed study of more important alkaloids will be found under their respective heads. See ANIMAL ALKALOIDS; PLANTS; POISONS; and separate articles on the more important alkaloids under their special names.

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ALKANET, ăl-kă'nĕt, (1) a genus of plants of the family Boraginaceæ, cultivated sometimes for their flowers. The evergreen alkanet (*Anchusa sempervirens*) is a native of Europe, is cultivated for its blue flowers and its pleasant verdure in winter. Other species are common as flower borders. *A. tinctoria* is grown in the Levant and the south of France. It is cultivated for its resinous red coloring matter. (2) A red coloring matter obtained from the roots of the orchanet herb (*Anchusa tinctoria*). It is chiefly used to impart a red color to cosmetics, varnishes, etc. Benzine is used to extract it from the roots, the benzine is then evaporated, leaving a thick paste soluble in alcohol, ether and other organic liquids, but insoluble in water. The chemical formula for purified alkanet is about $C_{15}H_{16}O_4$.

AL-KHOWARAZMI, ăl-koo'wā-rĕz'mē, Arabian mathematician of the 9th century. He was the librarian of Al-Mamun at Bagdad, and also worked in the Bagdad Observatory, where he carried on his astronomical and mathematical researches. Among his writings is a geographical treatise, 'Rasm Al-Ard,' giving the latitude and longitude of all places mentioned. He also wrote several mathematical treatises, including one on Hindu arithmetic, and 'Al Jabr wa'l Muqabalah,' discussing the quadratic equation and other algebraic problems; both of these were later translated into Latin, the latter giving algebra its name. See ALGEBRA, HISTORY OF THE ELEMENTS OF, and ARITHMETIC, HISTORY OF.

ALKMAAR, ălk-mär', Netherlands, a town in the province of North Holland; on the North Holland Canal and 20 miles north northwest of Amsterdam. It is regularly built; public walks cover the site of its former ramparts, and its finest public buildings are the 15th-century church of St. Lawrence and a richly decorated Gothic townhouse. It has manufactures of salt, sail-cloth, etc., and an extensive trade in cattle, corn, butter and cheese. Among interesting events in its history are its successful defense against the Duke of Alva in 1573, and the invention of damask-weaving by a citizen, Paschier Lammertyn, in 1595. To the west stood the castle of the counts of Egmont. Pop. 21,500.

ALKORAN. See KORAN.

ALKYL, the radicals of the alcohols (for example, methyl, CH_3; ethyl, C_2H_5; and propyl, C_3H_7) are collectively called alkyls. (See ALCOHOL). A compound of an alkyl with a halogen is called an alkylogen; and the metallic alcoholates are frequently called alkoxids, since they may be regarded as double oxides of a metal and an alcohol radical.

"ALL FOOLS" ARGUMENT, in British political controversy: Those who are in favor of tariff reform sometimes argue that nearly every other country in the world has adopted protection, and then wind up with the question, "Are they all fools?"

ALL FOR LOVE, or The World Well Lost. Dryden had been an innovator when in 1664 he asked that "the excellence and dignity of rhyme" be added to serious drama. He was an innovator again when he finally "disincumbered himself from rhyme" with the ingenious words "I admire the pattern of elaborate writing, but — I love Shakespeare." Nothing at the time could serve Dryden's purpose so well as to adapt the full free structure of Shakespeare's 'Anthony and Cleopatra' to the regular measures demanded by Restoration taste. For his day there was nothing particularly irreverent or original in this. Dryden himself had some years before adapted 'The Tempest,' and many others had been adapted by other men.

Such an undertaking was to be judged purely by the results. Judging by these standards it must be confessed that 'All For Love' was a success. In reducing Shakespeare's 40 scenes to five acts Dryden lost the epic sweep of the original. He lost as well the impression of the tragic pair at their moment of greatness and passion. The retrospective method gives a tone of plaintiveness to the whole composition. For the last two acts the author seems hard put to it to eke out the action and does so by developing a motive of jealousy below the level of the rest of the piece. But for his own day at any rate Dryden makes up for these faults by the expertness of his handling. Ten years are compressed in one final day, which happens to be the birthday of the protagonist. The characters are fit mouthpieces for dignified speech adorned with some high ornament. 'All for Love' was produced at the Theatre Royal in 1678 and in the same year was published with a preface by the author. According to Genest it was played some 15 times during the 18th century, the part of Cleopatra being taken by Nance Oldfield, Peg Woffington, and Mrs. Siddons. It is last mentioned at Bath in 1818. Sir Leslie Stephen is at one with other critics in considering it Dryden's finest play. Editions: Scott-Saintsbury (8 vols., 1882); Saintsbury (ed. 'Mermaid Series'); Noyes, G. R. (1910); Strunk (ed. 'Belles Lettres' Series, 1911). Consult Dryden's 'Essay on Heroic Plays' (Scott–Saintsbury, Vol. IV); Sherwood, M., 'Dryden's Dramatic Theory and Practice' ('Yale Studies in English,' No. 4); Saintsbury, G., 'Dryden' (in 'English Men of Letters Series,' 1881); 'Cambridge History of English Literature.'

THOMAS H. DICKINSON,
Author 'The Contemporary Drama of England.'

ALL HALLOWS. See ALL SAINTS' DAY.

ALL HALLOWS COLLEGE, Drumcondra, Dublin, Ireland. The foreign missionary college of All Hallows, as its name implies, was instituted for the exclusive object of educating priests for the foreign missions, for the purpose of supplying with missionary priests those parts of the world where the Gospel had never been preached. The missionaries, however, going forth from its halls, were to have as a primary claim on their attention the spiritual needs, to speak in native parlance, of the "Irish of the dispersion," who, owing chiefly to the effects of bad laws, had begun at that period to emigrate in large numbers from Ireland. All Hallows was founded in the year 1842 by the Rev. John Hand, a native of the diocese of Meath, Ireland, then a young man, but a few years previously ordained at Maynooth. It was formally opened on All Saints' Day of that year with only one student, a very small beginning indeed, but it increased in numbers and resources till it is now probably one of the greatest foreign missionary colleges in the world. It is at present, and has been for some time past, in charge of the Vincentian Fathers, and was never in a more flourishing condition. It shelters within its walls some 300 students, all destined for the foreign missions. It is pleasantly situated at Drumcondra, one of the suburbs of the metropolis, on a demesne of rich land, obtained for it through the efforts of Daniel O'Connell, at that time lord mayor of Dublin. A large number of Catholic priests in the United States received their philosophical and theological training at All Hallows.

ALL IS TRUE, a play attributed to Shakespeare. The burning of the Globe Theatre (29 March 1613) while the piece was being played destroyed the manuscript. Parts of the drama were incorporated into the play of 'Henry VIII.'

ALL SAINTS' BAY, or **BAHIA DE TODOS OS SANTOS,** a bay on the coast of the state of Bahia, Brazil, in lat. 13° S. and long. 39° W., forming an excellent natural harbor 37 miles long and 27 miles broad. It contains several islands, the largest of which, Itapasica, is 18 miles long and from 3 to 5 miles broad. On its east side stands the port of Bahia.

ALL SAINTS' DAY, a festival instituted by Pope Boniface IV, early in the 7th century, on the occasion of his transforming the Roman heathen Pantheon (the present Rotunda, or Santa Maria de' Martiri) into a Christian temple or church and consecrating it to the Virgin Mary and all the martyrs. It was first made a feast of obligation by Gregory IV in 835. It is kept by the Roman Catholic church and by churches in communion with the Church of England on 1 November, and by the Greek Church on the Sunday after Whitsunday. It is designed, as its name implies, to honor all departed saints and was formerly called All-hallows. In many American churches a custom has grown up of making the Sunday nearest 1 November the occasion of a service in memory of those who have died during the year. A chapel in St. Peter's in honor of all the saints was consecrated by Gregory III in 731, on 1 November, and from this local custom was derived the universal commemoration afterward enjoined on the entire Church.

ALL SORTS AND CONDITIONS OF MEN, a novel by Sir Walter Besant. The famous People's Palace of East London had its origin in this story; and because of it Besant was knighted. The story concerns chiefly two characters — the very wealthy orphan, Angela Messenger, and Harry Goslett, ward of Lord Joscelyn. Miss Messenger, after graduating with honors at Newnham, resolves to examine into the condition of the people of Stepney Green, in the Whitechapel region, where she owns great possessions. To indicate to the working women of East London a way of escape from the meanness, misery and poverty of their lives, she sets up among them a co-operative dressmaking establishment, she herself living with her work-girls. Her goodness and wealth bring happiness to many. The book ends with the opening of the People's Palace and with the heroine's marriage to Harry Goslett.

ALL SOULS' COLLEGE, Oxford, was founded in 1437 by Henry Chichele, archbishop of Canterbury, for a warden, 40 fellows, two chaplains and clerks. It was designed as a chantry where prayers might be offered for the souls of all Christians, especially those who fell in the war for the crown of France, and also as a society of fellows free from the care

of undergraduate students. Many of its members have been noted in history and law. There are now 50 fellows and two Chichele professorships. Fellows are chosen for their attainments in law and history. Blackstone, Gladstone, Jeremy Taylor, Sheldon, Heber, Salisbury and Curzon have been enrolled there. The Codrington Library of 70,000 volumes is one of the finest law libraries in England. The present arrangement of fellowships was fixed by statutes which came into operation in 1882.

ALL SOULS' DAY, the day on which the Catholic Church commemorates all the faithful deceased. It was first enjoined in 998 by Odile, Abbot of Cluny, on the monastic order of which he was the head, and soon afterward came to be adopted by the Church generally. It is observed on 2 November. Among the early Christians the names of the deceased were entered on the diptychs, or lists, used at the altar, from which the cleric read the names of those for whom he was required to pray. In the 6th century the Benedictines commemorated their departed brethren at Whitsuntide, and in Spain the commemoration took place on the octave of Pentecost.

ALL'S WELL THAT ENDS WELL is one of Shakespeare's best comedies. and one of the plays in which he has kept closest to the original from which he derived his plot and yet has given the freest rein to his creative fancy. In the first volume of William Paynter's 'Palace of Pleasure,' a collection of short stories in the assembling of which the author has laid under contribution ancient and modern storytellers, is the short tale 'Giletta of Narbona,' borrowed bodily from Boccaccio's 'Decameron,' somewhat to the disfigurement of the story itself, for Paynter was anything but a master of English prose. This tale Shakespeare took for the basis of 'All's Well that Ends Well,' which was probably written between 1590 and 1600. It was included in the folio edition of 1623; but it is supposed, however, to have originally appeared under the title of 'Love's Labor Won,' as a companion piece to 'Love's Labor Lost'; for a Shakespeare play under this title is listed by Meres in 1598, with accompanying description that fits only 'All's Well That Ends Well.' To its meagre incidents Shakespeare added others that give the plot a more dramatic cast; and he created additional characters that lend it greater vivacity and interest. Some of these characters are altogether the work of his own imagination, while others were developed from suggestions in the original story. For the Countess Roŭsillon, the Clown Lavatch, Parolles, the braggart and coward, Lord Lafeu, talkative but clear-headed, Shakespeare is in no way indebted to Paynter; and these are naturally the best characters in the play, with the one exception of the heroine, Helena. They stand apart from the others as special creations; are active, convincing, pleasing and life-like.

The outline of the plot of 'All's Well that Ends Well' is more like Boccaccio than Shakespeare. Helena, a young gentlewoman of great beauty, intelligence and wit, who is protected by the Countess Rousillon, mother of Bertram, Count of Rousillon, hero of the play, is deeply in love with Bertram, who, as a ward of the King, is summoned to the court of France, where his mother and Helena follow him. Helena cures the King of a supposedly incurable malady by means of a receipt of her dead father, a famous physician. The King offers her the hand of any of his young unmarried courtiers; and she chooses Bertram, who marries her at his sovereign's command but promptly disowns her after the marriage, telling her that he will never see her again until she secures possession of a ring he wears and has a child by him. Helena leaves his home, disguises herself as a young Florentine girl and is invited by her husband to his room, where she gets possession of the ring and complies with the requirements laid down by Bertram, who, finally realizing her cleverness and beauty, falls in love with her; and so 'All's Well that Ends Well.'

This comedy, though well constructed, excellently written and filled with well-drawn personæ, is seldom presented in modern times on account of the objectionable character of the main incidents of the plot. It is, in fact, superior to some other Shakespeare plays which are not infrequently seen upon the boards. It is rich in comedy and characterization and sparkles with wit and humor not inferior to Shakespeare's best; the dialogue is sprightly; the invention and plot excellent and the interest well sustained. The philosophical, sick old King, the amiable, good-hearted countess, the clever heroine, the strong-headed young hero, whose chief asset is his ability to fight; the comic knave Parolles; old Lord Lafeu, jovial yet scoffing, and Lavatch, the clown, with his ever-ready wit, together form a galaxy of star characters sufficient for several modern comedies. And they are presented to us framed with a bewildering richness of fine rhetorical passages.

ALLACTITE, a mineral found in Sweden, and crystallizing in small monoclinic prisms or tablets having the composition $7MnO.As_2O_5.4H_2O$. Its hardness is 4.5 and its specific gravity about 3.84. It exhibits double refraction to a marked degree, and varies in color from red to green, according to the direction from which it is viewed. This property has given it its name, "allactite," being derived from a Greek word meaning "to change." The variability in color is due to the varying absorption of the ordinary and extraordinary rays of the incident light. See PHYSICAL CRYSTALLOGRAPHY.

ALLAH, in Arabic, the name of God, a word compounded of the article *al,* and the word *Elah,* which signifies "the Adored" and "the Adorable," and synonymous with the singular of the Hebrew word *Elohim. Allah akbar* (God is great) is a Mohammedan war-cry.

ALLAHABAD, ăl'la-ha-băd' (from *Allah,* God; *abad,* abode; the "abode of God"), India, an ancient city, capital of a division and district of the same name, as well as of the whole of the northwest provinces, 72 miles west of Benares. The native town consists largely of mud houses. Its English suburb of Canningtown has much more of a European aspect. Among the remarkable buildings of Allahabad are a large triangular fort, occupying a point of land formed by the junction of the Ganges and Jumna; the Jumna Musjid, or great mosque; the mausoleum of Khosru; All Saints' Church;

the Roman Catholic cathedral; the Muir Central College, founded in 1874, the chief educational establishment of the northwest provinces; the Mayo Memorial and town hall. Allahabad is one of the chief resorts of Hindu pilgrims, who come partly to visit a sacred cave under the Chali Satum temple (whence it is said there is a subterranean passage to Benares), but chiefly to have their sins washed away by bathing in the waters of the sacred rivers of Ganges and Jumna at their junction, where believers see a third river, the Saraswati (which is in reality lost in the sands at a distance of 400 miles from Allahabad), mingle its current with those of the other two. A great fair held on 14 December is much attended by pilgrims. There are few manufactures. Allahabad forms a junction in the railway system between Bengal and Central India, and its trade is rapidly increasing. In the mutiny of 1857 it was the scene of a serious outbreak and massacre. Pop. 171,700. The division of Allahabad contains the districts of Cawnpur, Futtehpur, Hamirpur, Banda, Jhansi, Jalaun, Lalitpur and Allahabad. The agriculture of the division is greatly promoted by a canal 310 miles long, connecting the Ganges and the Jumna. About five-sixths of the surface is under cultivation, the principal crops being rice, pulse, wheat, tobacco, etc.

ALLAMANDA, a genus of shrubs of the family *Apocynaceæ,* consisting of a dozen species, natives of Brazil and Central America. Most of the species are climbing; they have entire, bright green, whorled leaves and large, terminal, yellow or purple flowers. Because of their showy flowers they are much cultivated in the United States and elsewhere, in the North in hothouses and in the South out of doors. The leaves of certain species have been used in medicine as a cathartic.

ALLAN, Sir Hugh, founder of the Allan Line of steamships: b. Scotland, 29 Sept. 1810; d. Edinburgh, 8 Dec. 1882. A clerk with limited education, he emigrated to Canada in 1824, was clerk in Montreal stores, became captain in the rebellion of 1837 and in 1838 succeeded his late employer as a partner in the shipping and ship-building business. In 1853 his firm began building iron screw steamships and their first vessel, the *Canadian,* made its first voyage in 1855, two more being used as transports in the Crimean War. The Allan Line, after many disasters, gained a permanent footing and has been a large element in developing Canadian prosperity. Sir Hugh was one of the projectors of the Canadian Pacific Railway and prominent in the political investigations to which it led He was a director in banking, telegraph, gold mining and other large business enterprises, and was knighted in 1871.

ALLAN, Maud, American danseuse: b. Toronto. At four years of age she removed to San Francisco, where her father became a naturalized American citizen. She took a scholarship at the Cogswell Polytechnic College, San Francisco; commenced studying the piano at the age of five, and made her first appearance as a pianist at 12. Soon afterward she went to Europe to continue her studies; spent five years at the Berlin Royal Academy High School of Music and took the highest diploma for piano-playing. Later, she abandoned her intention of becoming a professional musician, deciding to become a dancer instead, her idea being to represent music by dancing. After much fresh study, she made her first appearance as a dancer before an invited audience at the Conservatory of Music, Vienna, in 1902; she was highly complimented by the press. Her first public appearance took place at the Théâtre Molière, Brussels, and she subsequently performed at Berlin, Buda Pesth, Hamburg and Paris, at all of which places she aroused much enthusiasm. In 1908 she achieved a splendid success in London in 'The Vision of Salome,' and had the honor of dancing before Edward VII and Queen Alexandra. Subsequently she appeared successfully in New York. Consult her autobiography.

ALLAN, Sir William, Scottish artist: b. 1782; d. 1850. He was a fellow student with Wilkie in Edinburgh, afterward a student of the Royal Academy, London; then went to St. Petersburg and remained for 10 years in the Russian dominions. In 1814 he returned to Scotland and publicly exhibited his pictures, one of which ('Circassian Captives') made his reputation. He now turned his attention to historical painting and produced scenes from Scottish history and battle scenes; among them two pictures of the battle of Waterloo, one from the British, the other from the French position, and delineating the actual scene and the incidents therein taking place at the moment chosen for the representation. One of these Waterloo pictures was purchased by the Duke of Wellington. He traveled extensively, visiting Italy, Greece, Asia Minor, Spain and Barbary. In 1835 he became R.A., in 1838 president of the Scottish Academy; in 1842 he was knighted.

ALLANITE, a mineral, isomorphous with epidote, and containing rare metals of the Cerium and Yttrium groups. It is variable in composition, but is essentially a silicate of these metals, combined with aluminum, iron and calcium. It occurs in Norway and Finland and in the United States in Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Virginia and North Carolina; also in Canada. It was named for Thomas Allan, of Edinburgh, who described it in 1808. (Also called orthite).

ALLANTOIN, a-lan'tō-in, a substance found in the allantoic fluid of the cow, in the urine of sucking calves, in the leaf buds of the maple and in the bark of the horse-chestnut tree. It is readily soluble in alcohol and crystallizes in monoclinic prisms having the formula $C_4H_6N_4O_3$. It may be formed by treating uric acid with boiling water and PbO_2. Compounds of allantoin with several of the metals are known.

ALLAN'TOIS, a structure appearing during the early development of vertebrate animals — reptiles, birds and mammalia. It is largely made up of blood-vessels and, especially in birds, attains a large size. It forms the inner lining to the shell, and may thus be viewed as the surface by means of which the respiration of the embryo is carried on. In mammalia the allantois is not so largely developed as in birds and it enters largely into the formation of the placenta.

ALLARD, Marie Jules Paul, French church historian: b. Rouen, 15 Sept. 1841; d. Senneville-sur-Mer, 4 Dec. 1916. He was educated at

the Institut Join-Lambert, near Rouen; was substitute judge, Rouen, 1872–83 and from 1903 to 1915 was editor of *Revue des questions historiques*. He took part in the International Catholic Scientific Congress of 1888 and 1891 at Paris and that of 1894 in Brussels. He published: 'Les esclaves chrétiens depuis les premiers temps de l'Eglise jusqu' à la fin de la domination romaine en Occident' (1876); 'L'art chrétien sous les empereurs paiens' (1879); 'Esclaves serfs et mainmortables' (1884); 'Histoire des persécutions de l'Église' (5 vols., 1885–90); 'Paul Lamache' (1893); 'Le Christianisme et l'Empire romain' (1897); 'Saint Basile' (1898); 'Julien l'Apostat) (3 vols., 1900); 'Dix leçons sur le martyre' (1905); 'Saint Sidoine Apollinaire' (1910); 'Les origines du servage en France' (1913). He was a contributor to Cabrol's 'Dictionnaire d'archéologie chrétienne et de liturgie'; d'Alès' 'Dictionnaire d'Apologétique' and 'The Catholic Encyclopædia.'

ALLEGAN, Mich., a town and county-seat of Allegan County, 33 miles south of Grand Rapids. It is situated on the Kalamazoo River and on the Cincinnati N., Lake Shore & M. S., and the Pére M. railways. It is in the midst of a fertile region, and a large dam on the river a few miles above the village affords valuable water power. Among its industries are mills of various kinds, carriage works, furniture factories, etc. It contains a Carnegie public library, two banks, court house, city hall and public schools. First settled in 1835. The town water works are owned and operated by the municipality. Pop. 3,419.

ALLEGANY, N. Y., village of Cattaraugus County, 70 miles southeast of Buffalo, on the Allegheny River, and on the Erie and Pennsylvania railroads. It has important oil interests, contains a canning factory, several cheese factories and sawmills. Saint Elizabeth's Academy for Girls is located here, also the Catholic college and seminary of Saint Bonaventure, founded in 1859. The village was incorporated in 1905. Pop. 1,300.

ALLEGATION is the assertion, declaration or statement by a party of what he can prove. Under the reformed method of procedure adopted in nearly if not all of the States of the Union, the general rule that the allegations in the pleadings and the proof must correspond has been greatly relaxed. Under our present system a failure to prove an immaterial averment cannot in general be a material variance at the trial and will be disregarded. If the substance of the issue be proved it is sufficient. If a contract, for instance, agree in substance and legal effect with that stated in the complaint, the variance will be disregarded.

ALLEGHANY MOUNTAINS or **ALLEGHANY PLATEAU**, a name sometimes used to designate the entire Appalachian Mountain system, but more properly applied to the western range of this system in Pennsylvania, Maryland, Virginia and West Virginia. They begin near the New York and Pennsylvania border — the Catskills forming a northern outlier — and extend in a southwesterly direction into West Virginia, where the line of elevations is continued by other ranges across Tennessee. In the northern part the mountains have an elevation of about 2,000 feet (over 4,000 feet in the Catskills), but they gradually increase in altitude southward until in Virginia they rise to 4,500 feet above the sea. Throughout their extent they present a remarkably even crest-line with few gaps and isolated peaks. On the eastern side the Alleghany Front or Alleghany escarpment is an abrupt slope overlooking the Great Valley, a depression from 50 to 100 miles wide, lying between the "Front" and the Blue Ridge. On the west, the plateau has a gentler bounding slope. The range forms the water-parting between the streams draining into the Atlantic Ocean and the Gulf of Mexico. The former receives the drainage from the eastern slope principally through the Delaware, Potomac and James rivers, while the Ohio River collects most of the waters on the western side. Except at the eastern edge, where the rocks partake of the folding of the Appalachian Mountains proper, the sediments are nearly horizontal and the region is rather a deeply dissected plateau than a true mountain range. Limestone, sandstones and conglomerates are the predominant formations and range from the Cambrian to the Carboniferous systems. Immense coal-seams occur in the higher part of the series. See APPALACHIANS.

ALLEGHENY, Pa. See PITTSBURGH, PA.

ALLEGHENY COLLEGE, a coeducational (Methodist Episcopal) institution in Meadville, Pa.; organized 1815 as a Presbyterian college and transferred in 1833 to the Methodist Church under an agreement that it should be conducted on a non-sectarian basis. It early acquired the support of a number of prominent men, including John Adams, Thomas Jefferson, James Winthrop and William Bentley, the two latter making it the gift of their libraries. Bently Hall and Ford Memorial Chapel are among the finest buildings. The chief emphasis is placed on non-technical cultural subjects but there are also courses in the arts and sciences. In 1914 there were: Instructors, 22; students, 418; volumes in the library, 31,000; grounds and buildings valued at $850,000; productive funds, $648,750; income, $117,346; graduates, 1,911.

ALLEGHENY RIVER, a river of Pennsylvania and New York; a headstream of the Ohio. It rises in Potter County, Pa., and joins the Monongahela at Pittsburg. Among its tributaries are French Creek and Clarion and Kiskiminitas rivers. Its length is 400 miles and it is navigable for about 150 miles above Pittsburgh.

ALLEGIANCE. Allegiance is the obligation of obedience or service which one person owes to another or to the state. During the feudal age those who held lands of a feudal lord owed him allegiance; to-day, however, the allegiance of the individual is only to the state or its symbolic head, the king. The obligation is reciprocal, that is, it is due in return for the protection which the state of which he is a citizen, or subject, is bound to afford him. The laws of most states require an oath of allegiance as a condition of admission to citizenship; many exact a similar oath of persons enrolled in the military and naval forces, and some require it of persons appointed or elected to a civil office. In times of civil war an oath of

allegiance is usually required of insurgents as a condition of amnesty or of the restoration of their civil status. Violation of the oath of allegiance is severely punished, usually with the penalties of treason.

Ordinarily allegiance is an obligation of citizens only, but in the United States it is held that aliens enjoying as they do the protection of the laws owe the country a local and temporary allegiance which continues during their residence and for violation of which they are liable to prosecution for treason equally with citizens (Carlisle v. The United States, 16 Wall. 147).

The doctrine of the English common law was that of indefeasible allegiance, which was also the theory of the Roman law, *exuere patriam nemo potest,* according to which the individual could not of his own motion throw off his allegiance and take up another. "Once an English subject, always an English subject," unless with the consent of the sovereign, was the theory stated in an aphorism. The early jurists and commentators in the United States also inclined to this view and some secretaries of state followed this opinion. James Buchanan, secretary of state in 1845, however, asserted it to be an unqualified right of the citizen to change his allegiance at will, and in 1868 Congress passed a law affirming this view. This act declared it to be an inherent right of all people to expatriate themselves whenever they wished and to assume a new allegiance. Two years later the British Parliament by statute formally abandoned the doctrine of indelible allegiance and declared that any British subject not under disability and voluntarily naturalized in a foreign state should cease to be a British subject. The great majority of other states likewise have abandoned the doctrine of indelible allegiance and allowed their citizens or subject to voluntarily expatriate themselves, although some of them attach restrictions to the exercise of the right. Only Russia and Turkey hold to the old rule and refuse to recognize the legality of the naturalization of their subjects by foreign states, unless the consent of the sovereign has been previously obtained. See also CITIZENSHIP and NATURALIZATION.

JAMES W. GARNER.

ALLEGORICAL INTERPRETATION, or **ALLEGORISM,** a method used in the interpretation of the Scriptures. The method in brief is to take a plain statement and attach to it a symbolical meaning. Allegory has always been largely used. The Greek writers made use of it, especially Plato, Homer and Heraclitus. Sometimes the sacred writers themselves made use of it, thus explaining or clarifying a fact by means of a symbol or an allegory. The Old Testament contains many allegories. Nathan, in his rebuke of David, uses the allegory of the poor man's pet lamb to enforce his lesson. The allegory of the vine in the 80th psalm is another example. The finest of them all is the allegory of old age contained in the last chapter of the book of Ecclesiastes. Early Jewish writers in the Intertestamental period interpreted the Old Testament after this manner. The Jewish group of scholars in Alexandria under the leadership of Philo adopted this method to the exclusion of all others. This led of course to an abuse of the method and the production of interpretations as ridiculous as they were silly. The apocryphal 'Book of Wisdom' contains some instances. This method was in vogue in the days of Jesus Christ, and he frequently used it. The allegories of the sower, the vine and the branches, and the door are fine examples. Paul uses it several times in his Epistles. In Galatians iv, 21, he uses Hagar and Sarah, Isaac and Ishmael in an allegorical sense. The writer of the Epistle to the Hebrews shows the influence of the same method.

In post-apostolic times the method continued. It was made use of by Clement of Alexandria. Its chief exponent, however, was Origen, the great allegoriser of all time. Possessed of a poetical temperament and a vivid imagination, he utilized every possible occasion for making an allegory. He largely influenced succeeding commentators. The method continued to be popular through the Middle Ages. Early English divines made use of it. Finally the method seemed to concentrate about the interpretation of the Old Testament types seeming to prefigure facts in the New. In 1682 Benjamin Keach published a large folio volume in which he explained the types allegorically. Since then many have followed in his footsteps, including Samuel Mather of New England (1705). As late as 1847 Patrick Fairbairn published his 'Typology of the Scripture' in two volumes. It has since appeared in many subsequent editions. It is the latest book of any note on the subject. The historical method which aims scientifically to get at the exact facts has now entirely superseded the allegorical.

By the allegorical method "history is not *treated* as an allegory, but *converted* into allegory," which is not scientific nor in accord with modern methods of treating the Scriptures. No scholar of any note in our time places much dependence upon it. Consult Farrar, F. W., 'The History of Interpretation' (1885); Gilbert, G. H., 'Interpretation of the Bible' (1908); and the article "Allegory" in Hastings' 'Dictionary of the Bible.'

SAMUEL G. AYRES,
Garrett Biblical Institute.

ALLEGORY (from Greek *allo,* something else, and *agoreuein,* to speak), a figurative representation, in which the signs (words or forms) signify something besides their literal or direct meaning, each meaning being complete in itself. In rhetoric, allegory is often but a continued simile. Parables and fables are a species of allegory; for example, the beautiful parable in one of the tales in the 'Arabian Nights,' in which the three religions, the Mohammedan, Jewish and Christian, are compared to three similar rings, bequeathed to three brothers by their father. Sometimes whole works are allegorical, as 'Reynard the Fox,' Spenser's 'Faerie Queene,' and Bunyan's 'Pilgrim's Progress.' When an allegory is thus continued through long works it is indispensable to its success that not only the allegorical meaning should be appropriate, but that the story should have an interest of its own in the direct meaning apart from the allegorical signification. There was a time when every poem was taken as an allegory; even

such works as those of Ariosto and Tasso were tortured from their true meaning and made to pass for allegorical pictures. No poet has made use of allegory in a more powerful and truly poetical manner than the great Dante. Allegory is often made use of in painting and sculpture as well as in literature.

ALLEGRI, ạl-lā'grē, **Gregorio,** Italian composer and a singer in the papal chapel, considered one of the most excellent composers of his time: b. Rome about 1580 (according to others 1590); d. there 1652. His 'Miserere' has particularly distinguished him. It is even now regularly sung during Passion Week in the Sistine Chapel at Rome. Its subject is the 57th psalm (which in the Latin version begins with the word *Miserere*) and is composed for two choruses in five- and four-part harmony. This composition was once esteemed so holy that whoever ventured to transcribe it was liable to excommunication. In 1770 Mozart, then only 14 years of age, disregarded this prohibition, and after two hearings made a correct copy of the original.

ALLEGRO, ạl-lā'grō, an Italian word signifying gay, and used in music to express a more or less quick rate of movement. The degrees of quickness are indicated by additional qualifying words or by derivatives of the word *allegro.* Thus *allegretto* or *poco allegro* means rather lively; *allegro moderato, commodo, giusto,* moderately quick; *allegro maestoso,* quick but with dignity; *allegro assai* and *allegro molto,* very quick; *allegro con brio* or *con fuoco,* with fire and energy; *allegrissimo,* with the utmost rapidity. *Più allegro* is a direction to play or sing a little quicker. *Presto* indicates a still quicker rate than *allegro,* but there is usually also this difference between the *presto* and *allegro* movements, that the former demands nothing more than rapid execution, while the latter requires to be performed with expression as well as quickness. The first movement of a symphony and other similar compositions is called the *allegro.* See MUSIC.

ALLEINE, Richard, English theologian: b. Ditcheat, Somerset, 1611; d. Frome Selwood, 22 Dec. 1681. He was educated at Oxford, entered the ministry and was for a time his father's assistant in the ministry. From 1641 to 1662 he was rector of Batcombe in Somerset. The passage of the Act of Uniformity caused him to be ejected and afterward he preached wherever he could. He wrote 'Vindiciæ Pietatis' in 1663, the license for which was at first refused by the King's printer, Roger Norton, who on reading it brought back the sheets from the royal kitchen, whither he had sent them for kindling, and issued the work from his own shop. For this Norton was compelled to seek pardon on his knees at the council table.

ALLEMONTITE, a tin-white, metallic mineral regarded as a native alloy of arsenic and antimony, $SbAs_2$. It usually occurs in fine-granular or mammillary forms. Its hardness is 3.5 and specific gravity about 6.20. It is found at Allemont in France, also in Bohemia and Germany.

ALLEN, Alexander Viets Griswold, Protestant theologian: b. Otis, Mass., 4 May 1841; d. Boston, Mass., 1 July 1908. He was graduated from Kenyon College, Ohio, 1862, Andover Theological Seminary, 1865; rector St. John's Episcopal Church, Lawrence, Mass., 1865–67; professor of church history, Episcopal Theological School, Cambridge, 1867–1908. He wrote: 'Continuity of Christian Thought' (1884); 'Life of Jonathan Edwards' (1889); 'Religious Progress' (1893); 'Christian Institutions' (1897); 'Life and Letters of Phillips Brooks' (1900).

ALLEN, Alfred, American author and playwright: b. Alfred, N. Y., 8 April 1866. He was graduated from Alfred University, studied at the Johns Hopkins and Columbia universities and the American Academy of Dramatic Arts in which last he is now a professor. His plays include 'Jack the Giant Killer,' 'A Burglar Honeymoon,' 'Playmates' and 'Head of the House'; all of which have been produced on the stage. His novels are: 'The Heart of Don Vega,' 'Judge Lynch,' 'The Cup of Victory' (with Richard Hovey).

ALLEN, Charles Grant Blairfindie. See ALLEN, GRANT.

ALLEN, Charles Herbert, American diplomatist and banker: b. Lowell, Mass., 15 April 1848. He was graduated at Amherst 1869; was associated with his father in the lumber business in Lowell; served in both branches of the State legislature, and in Congress in 1885–89; was defeated as Republican candidate for governor of Massachusetts, 1891; and succeeded Theodore Roosevelt as assistant secretary of the navy in May 1898. On the passage by Congress of the Porto Rico tariff and civil government bill, in April 1900, the President appointed him the first civil governor of Porto Rico; he resigned July 1901. He retired from public life in 1902 and became associated with banking and allied interests in New Pork. In 1913 he was elected president of the American Sugar Refining Company.

ALLEN, Ebenezer, American soldier: b. Northampton, Mass., 17 Oct. 1743; d. 26 March 1806. He emigrated to Vermont in 1771 and was made a lieutenant in Col. Seth Warner's regiment of «Green Mountain Boys.» In 1776 he was a delegate to the conventions in the New Hampshire grants, and in 1777 to those which declared the State independent and framed its Constitution. In July of that year he was made captain in Herrick's battalion of «Rangers» and took an active part in the battle of Bennington; in September he captured Mount Defiance; and he took 50 prisoners among the troops retreating from Ticonderoga. He afterward became major and continued to win distinction during the war. He lived at Burlington in his later years.

ALLEN, Edward Patrick, Roman Catholic prelate: b. Lowell, Mass., 17 March 1853. He began early to fit himself for the priesthood and in June 1878 was graduated from Mount Saint Mary's College, Emmittsburg, Md. He was ordained priest in 1881 and in 1884 became president of his college. In January 1897 his Holiness Leo XIII appointed him bishop of Mobile, and on the 16 May following he was consecrated in the Baltimore Cathedral by Cardinal Gibbons. In May of the same year he was installed in his own cathedral, being the 5th bishop of Mobile to hold that office.

Under his care the diocese has prospered greatly and new churches, hospitals, schools and parishes testify to the bishop's diligence. The Catholic population of the diocese in 1897 was 17,000, and in 1913 it had risen to 42,500.

ALLEN, Elisha Hunt, American legislator and diplomat: b. New Salem, Mass., 28 Jan. 1804; d. 1 Jan. 1883. Graduating at Williams College 1823 he became a lawyer at Brattleboro, Vt., but soon removed to Bangor, Me., and was a member of the Maine legislature 1834–41 and speaker in 1838. He was elected representative to Congress in 1841. Removing to Boston in 1847, he was elected to the Massachusetts legislature in 1849. Appointed consul at Honolulu in 1852, he held that post till 1856, and thence till 1876 was chancellor, minister of finance and chief justice of the Hawaiian kingdom. Several times during that period and from 1876 onward he was its minister to the United States and died in Washington, dean of the diplomatic corps.

ALLEN, Elizabeth Akers (CHASE), American poet: b. Strong, Me., 9 Oct. 1832; d. 1911. She was married in 1860 to Paul Akers, the sculptor, who died in 1861; and in 1865 to E. M. Allen of New York. Her first volume, 'Forest Buds,' appeared under the pen name of Florence Percy (1855). Other works of hers are: 'The Silver Bridge and Other Poems' (1866); a volume of 'Poems' (1866), which contains 'Rock Me to Sleep, Mother' (her authorship of this popular ballad, once disputed, is proved in the New York *Times*, 27 May 1867); 'The High Top Sweeting and Other Poems' (1891); 'The Sunset Song' (1902).

ALLEN, Ethan, American soldier: b. Litchfield, Conn., 10 Jan. 1737; d. Burlington, Vt., 13 Feb. 1789. About 1769 he removed to Bennington, Vt. The Vermont territory had been given by the Crown to both New Hampshire and New York under conflicting grants; and when the dispute was settled (1764) in favor of New York, Governor Wentworth of New Hampshire had already granted 128 townships and continued to grant others up to the Revolution. New York at once proceeded to regrant the same territory, but the indignant settlers drove out the surveyors, applying the "beech seal" (fresh-cut rods) to enforce their withdrawal. The English government ordered the status quo to be respected by New York, and further disorders averted by granting only ungranted lands; the New York authorities continued to send surveyors, their grantees persisted in attempting to take possession of their lands, and the New Hampshire grantees continued to eject both deputy sheriffs and claimants by armed force and to chastise them besides. Allen at once took part in the dispute and soon became a leader: an athletic and adventurous giant, he was now in his element. In 1770 he was appointed agent for the settlers at Albany, where they were to plead their rights; the decision went against them, and a fresh attempt being made to enforce New York rights, the settlers raised a regiment for defense, called "Green Mountain Boys," of which Allen was made colonel. Tryon of New York, historically more renowned for vanity and bad temper than ability or success, proclaimed him an outlaw and offered £150 for his capture; but under Allen, Seth Warner and other able partisan chiefs, the settlers held New York at bay. Allen in 1774 answered publications in defense of the New York claims by a tract defending the Vermonters, reprinted in 1779. When the Revolution broke out Congress ordered Arnold to raise troops and seize the British fortresses on the New York border; but the Vermonters forestalled them by collecting a force of "Green Mountain Boys" at Castleton, Vt., under Allen's command, which on 10 May 1775 captured Ticonderoga and its garrison without a combat, and shortly after Crown Point and Skenesborough (Whitehall), giving them a mass of stores and the command of Lake Champlain. This action moved Congress to grant them the same pay as Continental soldiers, and to recommend the New York Assembly to employ them in the army under their own officers. Allen and Warner journeyed thither and asked admittance to the session; and after some grumbling over receiving proclaimed felons, a heavy majority voted to admit Allen, and later to raise a regiment of "Green Mountain Boys." Allen wrote a letter of thanks and proposed an invasion of Canada, which was rejected. He then joined Schuyler's army as a volunteer, was sent on secret missions to Canada, meeting on the last one Col. John Brown, who agreed to join him in an invasion of Canada. Fort Chambly was captured; but Brown left Allen in the lurch at the attack on Montreal, and Allen was taken prisoner 25 September and sent to England. He was chained and treated with great severity, but after some months was sent to Halifax, N. S., and exchanged 6 May 1778. On returning to Vermont he was appointed commander of the militia and Congress made him lieutenant-colonel in the regular army. The old land-grant feud still raged, and in the attempted British intrigue (1780–83) to have Vermont annex itself to Canada as a protection against New York, Allen paralyzed British military action by profession to consider a bribe for favorable action; later he was charged with treason, but the charge was not sustained. He settled in Bennington and finally in Burlington, where he died. He was a member of the legislature, and after the war was a delegate to Congress, where he worked for the admission of Vermont as a State, which it had been by self-proclamation since 1777. It was not till 1789, however, that New York waived its claims, and Allen did not live to see the result. He wrote the story of his captivity (1779); 'Vindication of the Opposition of Vermont to the Government of New York' (1779); and 'Reason the Only Oracle of Man' (1784), being a deist of the Paine stripe. Consult Sparks' 'Life' (Boston 1834); and Henry Hall's 'Ethan Allen' (New York 1892).

ALLEN, Frederick De Forest, classical scholar: b. Oberlin, Ohio, 1844; d. Cambridge, Mass., 4 Aug. 1897. He was graduated at Oberlin College 1863, and studied at Leipzig. From 1866 to 1880 he held professorships in the universities of Tennessee, Cincinnati and Yale. In 1880 he accepted the chair of classical philology at Harvard, holding it until his death. He published an edition of Euripides' 'Medea'

(1876), 'Remnants of Early Latin' (1880), a revision of Hadley's 'Greek Grammar' (1884), and 'Greek Versification in Inscriptions' (1880); besides contributing many papers to classical journals and editing numerous classics.

ALLEN, Fred Hovey, American author and Congregational clergyman: b. Lyme, N. H., 1 Oct. 1845. He was graduated at Hartford Theological Seminary while completing a university course and studied art abroad. Later he became pastor at Boston and Abington, Mass., and editor of the Suffolk County *Journal,* Boston, and a lecturer on art. He has published: 'Modern German Masters' (1885); 'Recent German Art' (1885); 'Great Cathedrals of the World' (1886); 'Popular History of the Reformation' (1887); and edited numerous costly art works. He brought to America the first successful photogravure process, made the first photogravure plates in America and the first book from American made plates. The making of books illustrated by American made plates printed in America was first accomplished by an American since all the imported workmen signally failed to produce either plates or printing.

ALLEN, Grant (CHARLES GRANT BLAIRFINDIE ALLEN), essayist, novelist, naturalist: b. Kingston, Canada, 24 Feb. 1848; d. London, 28 Oct. 1899. He was graduated at Oxford in 1871, and for a time was professor of logic and philosophy in Jamaica, but spent the greater part of his life in England. Widely known as a scientist in several departments, he aimed to popularize science, and his brilliant style contributed greatly to his success in this respect. His score or so of novels and works of light fiction attained great popularity, but though entertaining they have only an ephemeral value. His outspoken agnosticism is reflected in many of his writings. In science his chief titles are: 'Physiological Æsthetics' (1877); 'The Color Sense' (1879); 'Evolutionist at Large' (1881); 'Flowers and Their Pedigrees' (1883); 'Charles Darwin' (1885); 'Force and Energy' (1888); 'Story of the Plants' (1895); 'Evolution of the Idea of God' (1897). In fiction the following were most widely read: 'This Mortal Coil' (1888); 'The Great Taboo' (1890); 'The Dutchess of Powysland' (1892); 'The Woman Who Did' (1896); 'The British Barbarians' (1895); 'Under Sealed Orders' (1895).

ALLEN, Henry, American religious enthusiast: b. Newport, R. I., 14 June 1748; d. Northampton, N. H., 2 Feb. 1784. He settled in Nova Scotia, where he founded the sect known as "Allenites." He made numerous converts but the sect dwindled after his death. He asserted that Adam and Eve before the fall had not corporeal bodies; that there will be no resurrection of the body; that men are not bound to follow the ordinances of the Gospel; that the Bible is to be interpreted wholly in a mystic or spiritual sense. He was an eloquent preacher and published some sermons and hymns.

ALLEN, Henry Watkins, American soldier and public officer: b. Prince Edward County, Va., 29 April 1820; d. 22 April 1866. He removed in early youth to Missouri, where he was sent to Marion College; he subsequently became a teacher in Grand Gulf, Miss., studied law and entered practice there. He raised a company for Houston's Texas war against Mexico; and after the war was over resumed practice and was sent to the legislature in 1846. Settling in Baton Rouge, he was elected to the Louisiana legislature in 1853. In 1859 he went to Italy, to share her struggle for independence against Austria; but arriving after it was over, made a tour of Europe, which he described in 'Travels of a Sugar Planter.' He was elected to the legislature in his absence. He was one of the Southern Whigs who joined the Democrats after the party break-up caused by the Kansas-Nebraska bill. At the opening of the war he was commissioned by the Confederacy lieutenant-colonel; later colonel and military governor at Jackson. He was wounded at Shiloh; constructed fortifications at Vicksburg; was disabled at Baton Rouge; made brigadier-general September 1864; and shortly after elected governor of Louisiana. He was a vigorous and efficient magistrate, with almost dictatorial powers. After the war he migrated to Mexico and started the (English) Mexico *Times* in the City of Mexico, where he died.

ALLEN, Horace Newton, American minister: b. Delaware, Ohio, 23 April 1858. He was graduated at Ohio Wesleyan University, and after a medical course went to China as Presbyterian missionary. Going to Korea in 1884 he was in Seoul at the time of the *coup d'état* of that year and saved the life of a prince related to the Queen; he was thereupon made court physician and allowed to establish a hospital under government orders. He came to Washington in 1887 with the first Korean legation, and returned in 1890 as United States secretary of legation. He won great confidence for sagacity and acquaintance with Korea and in 1897 was made United States minister there. He has written: 'Korean Tales' (1889); 'Chronological Index of Foreign Relations of Korea from Beginning of Christian Era to 20th Century' (1900, supplemental 1903); 'Korea: Fact and Fancy' (Seoul 1904); 'Transactions of the Foreign Society of Korea'; 'Things Korean' (Seoul 1908).

ALLEN, Horatio, American engineer: b. Schenectady, N. Y., 1802; d. 1889. Graduating at Columbia University in 1823, in 1826 he was resident engineer on the summit level of the Delaware & Hudson Canal and was sent to England in 1828 to buy locomotives for its proposed railway. In 1829 he made the first locomotive trip in America at Honesdale, Pa., with the 'Stourbridge Lion.' He was chief engineer, 1829–34, of the South Carolina Railway, then the longest line in the world; and in 1838–42 was chief assistant engineer of the Croton Aqueduct. He was chief engineer and afterward president of the Erie Railway, consulting engineer of the Panama Railway and the Brooklyn bridge; president of the American Society of Civil Engineers 1872–73. He invented the swivel car-truck.

ALLEN, Ira, younger brother of Ethan (q.v.) and a "Green Mountain Boy": b. Cornwall, Conn., 21 April 1751; d. 7 Jan. 1814. He went to Vermont in 1772 and was an active supporter of Ethan in the "beech seal" proceedings. He was a member of the Vermont legislature 1776–77 and of the Vermont Constitutional Convention 1778; was its first secretary of state,

then its treasurer and surveyor-general. He was in the battle of Bennington, 1777. In 1780–81 he was a Vermont commissioner to Congress to contest the New York land claim. In 1789 he aided in organizing the University of Vermont; and in 1792 was a delegate to the convention that ratified the United States Constitution after Vermont's admission as a State. In 1795, as senior major-general of militia, he went to France and bought arms to be sold to the State; but in returning was captured by an English cruiser, taken to England and charged with supplying the Irish rebels with arms, and only won his suit after eight years. Imprisoned in France in 1798 he returned to the United States in 1801. He wrote 'The Natural and Political History of Vermont' (London 1798); 'Statements Appended to the Olive Branch' (1807).

ALLEN, James Lane, American novelist; b. near Lexington, Ky., 1849. He was educated at Transylvania University in his native State and was successively an instructor in Kentucky University and Bethany College, West Virginia. In 1886 he removed to New York city and has since devoted himself entirely to literary pursuits. In his short stories and novels he has usually employed a Kentucky background, and his finished literary style, though somewhat too highly elaborated for the taste of the average reader, has been much admired by the more critical. His prose is characterized by a markedly poetic cast, and his realism is of that profounder kind which concerns itself with essential truths rather than with photographic fidelity to local types. His published books comprise 'Flute and Violin' (1891); 'The Blue Grass Region and Other Sketches' (1892); 'John Gray, a Novel' (1893); 'A Kentucky Cardinal' (1894); 'Aftermath' (1895); 'A Summer in Arcady' (1896); 'The Choir Invisible' (1897); 'The Reign of Law' (1900); 'The Mettle of the Pasture' (1903); 'The Bride of the Mistletoe' (1909); 'The Doctor's Christmas Eve' (1911); 'The Heroine in Bronze' (1912); 'The Last Christmas' (1913); 'The Land of Youth' (1915); 'The Cathedral Singer' (1916); 'The Kentucky Warbler' (1917). See FLUTE AND VIOLIN.

ALLEN, Joel Asaph, American naturalist; b. Springfield, Mass., 19 July 1838. He studied under Agassiz at Harvard; took part in scientific expeditions to Brazil, the Rocky Mountains and Florida 1865–69; was chief of the scientific party accompanying the Northern Pacific Railroad survey 1873, and curator of vertebrate zoology in the American Museum of Natural History, New York, since 1885. He is author of 'Monographs of North American Rodentia' (with E. Coues, 1877); 'History of North American Pinnipedia' (1880); editor of *Bulletin of Nuttall Ornithological Club* (1876–83), and of its successor, *The Auk* (1884–1901); *Bulletin and Memoirs of the American Museum of Natural History* (1889–1905). He has written also 'Mammals of Patagonia' (1905) and 'Ontogenetic and Other Variations in Musk-Oxen' (1913).

ALLEN, SIR John Campbell, Canadian jurist: b. Kingslear, N. B., October 1817; d. Fredericton, N. B., 27 Sept. 1898. He was member of the New Brunswick house of assembly 1856–65; solicitor-general 1856–57, speaker 1863–65; attorney-general 1865. He opposed confederation. He was chief justice of the Supreme Court of New Brunswick 1875–96, and was knighted in 1889. His 'Law Reports' (6 vols.) and rules of the Supreme Court and acts of assembly relating to the practice of the courts are ranked highly.

ALLEN, John Romilly, English civil engineer and archæologist: b. London, 9 June 1847; d. 5 July 1907. Educated at Rugby and King's College, London, he became resident engineer on Baron de Reuter's Persian railways and on the construction of docks at Leith and at Boston, Lincolnshire; was lecturer on archæology at Edinburgh University. His books are 'Design and Construction of Dock Walls' (1876); 'Early Christian Symbolism in Great Britain' (1887); 'Monumental History of the Early British Church' (1889); 'Early Christian Monuments of Scotland' (1903); 'Celtic Art in Pagan and Christian Times' (1904).

ALLEN, Joseph Henry, Unitarian clergyman and author: b. Northborough, Mass., 21 Aug. 1821; d. Cambridge, Mass., 20 March 1898. He was graduated at Harvard 1840 and at its divinity school 1843 and filled pastorates at Northborough, Roxbury, Mass., Washington, D. C., Bangor, Me., and other places till 1878. For 12 years he was editor of the *Christian Examiner*. He was also lecturer on ecclesiastical history at Harvard 1878–82, editor of the *Unitarian Review* 1887–98 and a prolific writer on religious and philosophical subjects. His chief works are: 'Ten Discourses on Orthodoxy' (1849); 'Hebrew Men and Times' (1861); 'Christian History in Its Three Great Periods' (3 vols., 1880–82); 'Positive Religion' (1892); 'Unitarianism Since the Reformation' (1894); translations of Renan's 'Anti-Christ,' 'Origins of Christianity,' and 'History of the People of Israel.' A Latin grammar and other schoolbooks, prepared in collaboration with Prof. J. B. Greenough, were extensively used.

ALLEN, Karl Ferdinand, Danish historian: b. Copenhagen, 23 April 1811; d. there, 27 Dec. 1871. He became professor of history and northern archæology at the University of Copenhagen in 1862. His principal works are 'Handbook of the History of the Fatherland' (1840), very democratic in tone, and 'History of the Three Northern Kingdoms' (1864–72).

ALLEN, Richard, preacher: b. 1760; d. Philadelphia, 26 March 1831. He organized the first church for colored people in the United States and was elected first bishop of the African Methodist Episcopal Church, 1816.

ALLEN, Robert, American soldier: b. Ohio about 1815; d. Geneva, Switzerland, 1886. Graduating at West Point in 1836, he was second lieutenant in the Seminole war, assistant quartermaster in the Mexican war, brevetted major for conduct at Cerro Gordo and was in the battles that led to the capture of the City of Mexico. Appointed chief quartermaster of the Pacific division, he was transferred to Missouri at the outbreak of the Civil War, with headquarters in St. Louis, in charge of supplies and transportation for armies in the Mississippi Valley. He was made colonel in 1862, brigadier-general of volunteers 1863, brevet brigadier-general in the regular army 1864, brevet major-general 1865. From November 1863 to 1866 he was chief quartermaster

of the Mississippi Valley with headquarters at Louisville, outfitted Sherman's march across country to Chattanooga and the Kentucky, Virginia and North Carolina expeditions. After serving a second time as chief quartermaster of the Pacific division he was retired in 1878.

ALLEN, Thomas, American landscape and animal painter: b. St. Louis, 19 Oct. 1849. He studied at Washington University, graduated at Royal Academy of Düsseldorf and studied in France three years. Has frequently exhibited at the Paris salons and was a judge of awards at the Worlds' Fair, Chicago 1893. He was chairman of the International Jury of Awards at the Louisiana Purchase Exposition 1904, president of the International Jury at St. Louis in 1909 and in 1910 he became chairman of the Art Commission of the city of Boston.

ALLEN, Viola, American actress: b. Alabama, 27 Oct. 1867. She made her début at the age of 15 at Madison Square Theatre, N. Y., in 'Esmeralda.' She has played leading classical, Shakespearean and comedy rôles. Between 1893–1900 she created and played parts in 'Sowing the Wind,' 'The Masqueraders,' 'Under the Red Robe,' and starred in Hall Caine's 'Christian,' F. M. Crawford's 'In the Palace of the King,' Hall Caine's 'The Eternal City' (1902), Shakespearean rôles (1903–05). Among her best known Shakespearean rôles are 'Cymberline' (1906); 'Twelfth Night,' 'A Winter's Tale,' 'As You Like It.' Consult Strang, L. C., 'Famous Actresses of the Day in America' (Boston 1899).

ALLEN, William, Cardinal, English ecclesiastic: b. Lancashire 1532; d. at Rome, 16 Oct. 1594. He studied at Oxford and was Fellow of Oriel College but owing to the persecution of Catholics under Queen Elizabeth he left England, and in 1568 he founded an English College at Douay, where aspirants to the priesthood might obtain the instruction denied to them at home. During the first five years of its existence, this college trained and sent back to England over 100 priests. Another of his claims to the gratitude of English-speaking Catholics is that while professor at Douay, in collaboration with Gregory Martins and Richard Bristow, he translated the Bible from the Latin Vulgate into English. This translation is known as the Douay Bible and is the one generally used by Catholics in England and America. He published 10 volumes, chief among which is 'Certain Brief Reasons Concerning Catholic Faith' (1564).

ALLEN, William, American preacher and miscellaneous writer: b. Pittsfield, Mass., 2 Jan. 1784; d. Northampton, Mass., 16 July 1868. He became president of Dartmouth University in 1817, and was president of Bowdoin College 1820–39. Of numerous works, both in prose and verse, the best known is 'American Biographical and Historical Dictionary' (3d ed. 1857).

ALLEN, William, American public official: b. Edenton, N. C., 1806; d. 11 July 1879. He studied law at Chillicothe, Ohio, was admitted to the bar at 21, and in three years had become noted as a coming leader. In 1832 he was elected (Democratic) member of Congress by one vote, the youngest member of the 22d Congress. He was a leading champion of his party; took an active part in the 1836 canvass for Van Buren, and was given the United States senatorship by the Democrats at the earliest age of any senator before or since. He was re-elected in 1843, and in 1848 was tendered the nomination for the Presidency by the supporters of both Cass and Van Buren, but refused from loyalty to Cass. After the expiration of his term Mr. Allen took no further part in public life for nearly a quarter of a century, till 1873 when he was elected governor of Ohio; again nominated in 1875 as a "rag-money" champion, he was defeated by Rutherford B. Hayes. His stentorian voice gave him the congressional nickname of the "Ohio Gong"; and he is credited with the famous slogan of the campaign of 1844 on the question of the northwestern boundary, "Fifty-four forty or fight."

ALLEN, William Francis, historian and essayist; b. Northborough, Mass., 5 Sept. 1830; d. 9 Dec. 1889. He was graduated at Harvard in 1851; studied at Berlin, Göttingen and Rome, 1854–56; was professor of Latin and history in the University of Wisconsin 1867–89 and is noted as a scholar of wide and varied attainments, equally strong in the linguistic, historical and archæological sides of his subjects. A list of his writings covers 30 12mo pages. Three of especial interest may be found in the Transactions of the American Philological Association for the years given: 'The Battle of Mons Graupius' (1880); 'Lex Curiata de Imperio' (1888); 'The Monetary Crisis in Rome A.D. 33' (1887).

ALLEN, William Henry, American naval officer: b. Providence, R. I., 1784; d. 1813. He entered the navy in 1800 and served in some of the greatest naval battles in American history. For bravery displayed on the *Chesapeake* and *United States* he was made commander of the brig *Argus* in June 1813. He did great damage to English commerce in the Irish Channel, capturing in a month 27 ships. In a few days the *Argus* was taken by the English brig *Pelican*. In the battle Allen was shot, died soon afterward and was buried with military honors in Plymouth, England.

ALLEN, Zachariah, American inventor: b. Providence, R. I., 15 Sept. 1795; d. 17 March 1882. He was graduated at Brown University in 1813, and was admitted to the bar in 1815, but soon turned his attention to manufacturing. He traveled in Europe 1825, to study manufacturing methods, and on his return published the 'Practical Tourist.' He invented in 1821 the first hot-air furnace for household use; in 1833 the automatic cut-off valve for steam engines; and later an improved fire engine, extension rollers and a storage system for water-power. He first suggested the system of mutual mill insurance, and drafted laws to regulate the sale of explosive oils. He was the first to compute the motive power of Niagara. He was a member from 1822 and president from 1880 of the Rhode Island Historical Society. He published 'The Science of Mechanics' (1829); 'Philosophy of the Mechanics of Nature' (1851); 'Solar Light and Heat, the Source and Supply' (1879); etc.

ALLEN-A-DALE, the friend and confidant of Robin Hood in the Robin Hood ballads.

ALLENBY, Sir **Edmund Henry Hynman,** K.C.B., English soldier: b. 23 April 1861. He entered the Inniskilling Dragoons and served with the Bechuanaland Expedition in 1884–85 and in Zululand in 1888. He served with great distinction throughout the whole South African War 1899–1902 in command of cavalry operations: commanded the 5th Royal Irish Lancers 1902–05, and the 4th Cavalry Brigade from 1905 to 1910. From 1910 till 1914 he was inspector of cavalry. He accompanied the first British Expeditionary Force to France in the European War and commanded the cavalry division in the great retreat from Mons. He was specially mentioned by Sir John French for his skilful handling of the troops. He was promoted to lieutenant-general in January 1916; fought at the battle of the Somme; was promoted to general in June 1917 and transferred to Mesopotamia to co-operate with General Maude (q.v.). On 11 Dec. 1917 he took Jerusalem from the Turks, and on 21 Feb. 1918 he also captured Jericho. See WAR, EUROPEAN; MESOPOTAMIA CAMPAIGN.

ALLENITES. See ALLEN, HENRY.

ALLENSTEIN, äl'lĕn-stīn', Germany, town of East Prussia, on the river Alle, 30 miles from the Russian frontier and 100 miles by rail northeast of Thorn. It is a fortified garrison town, and has manufactures of iron, machinery, stoves, matches, barrels, etc., and an active trade in grain and lumber. An important railway junction, an airship station, it was the headquarters of the 20th German Army Corps when, in the first invasion in August 1914, it was occupied by the Russians, who, however, were compelled to retire a few days later. Pop. 33,000.

ALLENTOWN, Pa., city and county-seat of Lehigh County, on the Lehigh Valley, Central of New Jersey, Philadelphia and Reading and the Perkiomen railways and the Lehigh Canal, 92 miles west of New York city, 55 miles north of Philadelphia and 98 miles east of Harrisburg. The commercial and industrial metropolis of the Lehigh Valley, covering an area of six square miles, Allentown is well built on a plateau sloping toward the confluence of the Lehigh, Little Lehigh and Jordan rivers, and is the centre of three great trolley systems, touching every important city, town and village within a radius of 36 miles, and extending in a two-hour connection to Philadelphia. The power plants, car barns and machine shops of one transit company alone represent an investment of over $1,350,000. Nearly 600 diversified industries find a home in Allentown, including iron, silk, furniture, shoes, cigars, hosiery, dyeing, automobile, wire, cement blocks, brick, clothing, lumber, automobile fire engines, etc. According to the special census of manufactures for the year 1914, there were 297 establishments of factory grade, employing 15,072 persons, of whom 13,685 were wage earners, receiving a total of $6,501,000 in wages. The aggregate of capital employed amounted to $26,716,000, and the value of the output was $33,918,000; of this, the value added by manufacture was $13,213,000. These figures show an increase of 29 per cent since 1909. Besides the local industries, Allentown is commercially interested in the 18 cement companies with 34 mills in the Lehigh district employing 12,000 men. They average an annual output of 25,000,000 barrels or about one-third of the total product of the United States. Within a 30-minute trolley ride is the $50,000,000 plant of the Bethlehem Steel Company, employing among its 12,000 men, from 1,000 to 1,200 skilled mechanics from Allentown. Allentown ranks second only to Paterson in the United States for the manufacture of silks. Here is held annually with a four-day attendance of 200,000, the "Great Allentown Fair," the greatest county fair in the United States. The large court house, fine hospital, free public library, many of the handsome churches, hotels, elegant banking institutions, spacious prison, and other public buildings, are of hewn limestone. The numerous educational buildings, 22 public schools, one open-air school, five colleges, include Muhlenberg College, a Lutheran institution founded in 1867, and the Allentown College for Women. Allentown maintains parks, well-equipped play grounds, an abundant pure spring water supply, pumped direct from the spring to the home with a daily flow of 12,000,000 gallons; a street main supply of steam heat; an unlimited supply of electric power for manufacturing purposes and for its brilliantly illuminated streets, mercantile establishments, and homes; and a motorized fire department. A concrete bridge which cost $500,000 connects a rapidly growing section. By legislative enactment effective 1 Dec. 1913, the city is governed by a commission council of five members, including the mayor. The city's annual income averages $750,000.

Allentown was founded in 1762 by William Allen, Esq., Chief Justice of the Province of Pennsylvania, father-in-law of Governor John Penn, and a great friend of the Penn family from whom he derived his grants of land, and named Allentown in honor of its founder. Here, during the Revolution, the Liberty Bell, the bells now in Christ Church, and St. Peter's, Philadelphia, were concealed by the Americans; and here, in 1799, John Fries (q.v.), of "Fries Rebellion" notoriety, fomented the German opposition to the "window tax." First inhabited by 13 German families and by the influence of the neighboring towns cut off for several years from the different post routes, it remained unprogressive until, in 1811, by the division of Northampton County, it became the seat of justice of Lehigh County, and by the act of the legislature passed 18 March 1811, was incorporated as Northampton borough with a population of about 800. With its advance to the rank of a county-seat, the town improved rapidly, and its accessibility to deposits of limestone, iron ore, anthracite coal, slate, zinc, cement, etc., added to its increasing importance in trade and wealth. An inadequate water supply, one of its chief drawbacks, was removed in 1828 by the organization of a municipal water-works plant. In 1838 the original name of the town was restored, and in 1867 it received a special charter. Pop. (1910) 51,913; (1916) 65,000 — including suburbs, 150,000. Consult Roberts, C. H., and others, 'History of Lehigh County' (3 vols., Allentown 1914).

ALLEPPI, a-lĕp'ē, or **ALLAPALAY,** a-läp'a-lā, India, seaport town of Travancore State, Madras, 32 miles south of Cochin. Its fine harbor facilitates a large export trade in

coffee, cocoanuts, pepper, cardamoms, and local manufacturers of coir matting. Pop. 25,000.

ALLERTON, Isaac, one of the "Pilgrim Fathers": b. England about 1583; d. New Haven, Conn., 1659. He was one of the most influential members of the Plymouth Colony, but on account of some disagreement with his associates he removed to New Amsterdam in 1631, and later to New Haven. Mary Allerton, his daughter, was the latest survivor of the original Mayflower company.

ALLIACEOUS PLANTS. See ALLIUM.

ALLIANCE, Neb., city and county-seat of Box Butte County, 350 miles northwest of Lincoln, on the Chicago, Burlington and Quincy Railroad. Stock-raising and butter-curing are its chief industries. The electric lighting plant and waterworks are the property of the municipality. Pop. 4,000.

ALLIANCE, Ohio, a city of Stark County, 56 miles southeast of Cleveland, an important railroad centre for the Lake Shore and Michigan Southern, Pittsburg, Fort Wayne and Chicago, Alliance, Niles and Ashtabula, Cleveland and Pittsburg railways and three interurban lines. Located in a fertile grain-growing region on the Mahoning River 1,000 feet above the sea and 500 feet above the level of Lake Erie, close to coal mines and an unlimited supply of natural gas, Alliance's leading industries are electric overhead cranes, heavy machinery, structural iron, boilers, brass, bronze and copper goods, steel foundries, overalls, flour mills, cash registers, agricultural implements, pipe organs, rubber goods, auto tires auto jacks, electric furnaces, hollow tile, cattle feed, butter and cheese. The United States census of 1914 recorded 52 manufacturing establishments of factory grade, employing 2,806 persons, of whom 2,333 were wage earners receiving $1,617,000 in wages. The aggregate capital engaged was $8,665,000, and the output was valued at $7,175,000; of this, $3,519,000 was added by manufacture. These figures show an increase of 17 per cent since 1909. It has an annual bank clearing averaging $26,700,000 and an annual payroll of $8,000,000. Among its public buildings are the city hall, Mount Union College, Carnegie library, the Y. M. C. A. institution and numerous church edifices, including those of German, Greek Catholic and Rumanian faiths. The city is administered by a mayor elected biennially, seven councilmen, a director of public safety and a director of public service. The annual recepits average $491,600; expenditures, $405,000. The city owns its water-works plant. Alliance dates from a settlement of 1838 named Freedom; it was renamed Alliance in 1851, was incorporated as a village in 1854 and received a city charter in 1888. Pop. (1910) 15,083; (1916) 22,600.

ALLIANCE ISRAELITE UNIVERSELLE. See JEWS AND JUDAISM — ALLIANCE ISRAELITE UNIVERSELLE.

ALLIANCE OF THE REFORMED CHURCHES HOLDING THE PRESBYTERIAN SYSTEM, a voluntary organization popularly styled the Presbyterian Alliance, formed in London in 1875. Its councils have much moral significance but possess no legislative authority. Rather more than 90 Presbyterian bodies are represented in the alliance, with some 25,000,000 adherents in all parts of the world. The first general council of the alliance met in Edinburgh in 1877; and subsequently Philadelphia, 1880: Belfast, 1884; London, 1888; Toronto, 1892; Glasgow, 1896; Washington, 1899; Liverpool, 1904. Between councils business is entrusted to an executive commission.

ALLIANCE, TRIPLE. See TRIPLE ALLIANCE.

ALLIANCES, in international relations, are coalitions or leagues entered into between rulers or states for the purpose of combined action of a political or military nature. An alliance may be defensive or offensive, or both, in giving circumstances stipulated for in a treaty. A treaty is the contract signed by the representatives of the states which are parties to the alliance, and defines the conditions under which the contracting powers are pledged to defend each other against an attack in war, or of jointly attacking another state. Nominally, only independent or "sovereign" states have the power to contract alliances; yet there have been several cases where states under suzerainty have concluded alliances without consent of the suzerain. A neutralized state, i.e., a state such as Belgium, the existence of which is guaranteed by other states, can contract alliances only for the purpose of defense; an offensive alliance would involve a breach of its neutrality. Alliances may be permanent or temporary; in the latter case they expire with the period of time for which they were formed, and are either renewed or "denounced" (canceled). It is a generally recognized rule of international law — in theory, at least — that immoral obligations cannot be the object of an international treaty; hence offensive alliances are regarded as valid only when their object is not immoral. Yet what may appear immoral to the outsider may be quite otherwise to those directly involved. An interesting example of this kind is furnished by the Balkan League (q.v.). Aggressive in intent (and therefore "immoral"), the League made war upon Turkey in order to liberate their respective co-religionists and co-nationals from political oppression, a perfectly "moral" undertaking. The most important conditions of an alliance are those which refer to mutual support in the event of war, which may consist either of military or of naval assistance, or of both. Where financial assistance only is involved, such a pact is termed a treaty of subsidy, not an alliance. Any agreement involving physical — as apart from "moral" — support, or the permitting of the passage of troops or of warships through territorial waters, constitutes an alliance. Thus, strictly speaking, the passage of the *Goeben* and *Breslau* through the Dardanelles early in the war ipso-facto constituted an alliance between Turkey and the Central Powers as the vessels were not interned according to international law. The term *casus fœderis* signifies the occurrence of the event provided for by treaty which makes it imperative for one or more of the contracting parties to render the assistance promised under the terms of the alliance existing between them. In a defensive alliance the *casus fœderis* arises immediately war is declared against one of the allies. Unless the *casus fœderis* is precisely defined in the treaty of

alliance, different interpretations and controversy may arise. Under the terms of the Triple Alliance, for instance, Italy was pledged to support Austria if that country were attacked. Austria, however, made war on Serbia, which the Italian government regarded as an aggressive, and not defensive, act, and therefore claimed that the *casus fœderis* did not arise.

Separate articles are devoted to DUAL ALLIANCE, GRAND ALLIANCE, HOLY ALLIANCE, QUADRUPLE ALLIANCE, TREATIES and TRIPLE ALLIANCE (all of which see.) An alliance (the Dual) was started in 1893 between France and Russia and definitely established in 1897. In 1903 was initiated the so-called «Entente Cordiale» between France and Great Britain, which became definite in 1905 after the Anglo-French Convention of 1904, by which were settled all the outstanding disputes between the two countries referring to Egypt, Morocco, and the Newfoundland Fisheries. The Anglo-Russian Agreement of 1907 similarly settled disputes between those two countries, and the Entente developed into the Triple Entente of Great Britain, France and Russia. Just after Germany had declared war on Russia in 1914, Sir Edward (now Viscount) Grey informed the House of Commons (3 August) that «The Triple Entente was not an alliance; it was a diplomatic group. . . . Up till yesterday no promise of anything more than diplomatic support was given. . . . We are not parties to the Franco-Russian Alliance. We do not even know the terms of it.» After the Morocco crisis in 1911 Sir Edward Grey had written to the French Ambassador (22 Nov. 1912) to the following effect: « . . . I agree that, if either government had grave reason to expect an unprovoked attack by a third Power or something which threatened the general peace, it should immediately discuss with the other whether both governments should act together to prevent aggression and to preserve peace, and, if so, what measures they would be prepared to take in common.»

The Anglo-Japanese Alliance dates from 1902; it was renewed in 1905 and revised in 1911. The objects aimed at in the treaty are the maintenance of peace in eastern Asia and India; the preservation of the independence and integrity of China with the «open door»; and the maintenance of the territorial rights and the defense of the special interests of the contracting powers in the Far East. It is also provided that if by reason of unprovoked attack or aggressive action, wherever arising, on the part of any other power or powers, either party should be involved in war in defense of its territorial rights or special interests, the other party will at once come to the assistance of its ally, and will conduct the war in common, and make peace in mutual agreement with it. This agreement was modified in 1911, mainly by the addition of a new article providing that «should either party conclude a treaty of general arbitration with a third Power, it is agreed that nothing in this agreement shall entail upon such party an obligation to go to war with the Power with whom such treaty of arbitration is in force.» The proviso as to arbitration had in view the Anglo-American *unlimited* Arbitration Treaty signed in 1911, but not ratified by the Senate (see below.

The Anglo-Portuguese Alliance has a remarkable history. On 23 Feb. 1916 Portugal seized 36 German and Austrian merchant ships interned in her ports. Germany declared war o 10 March 1916. The Portuguese Minister in Washington, Viscomde de Alte, stated that his country's entrance into the war was in fulfilment of a treaty obligation entered into between England and Portugal on 16 June 1373, of 543 years ago. The friendly relations which Henry II of England (d. 1189) had established with the princes of the Iberian Peninsula made the few dealings between the early Portuguese monarchs and the English court of a generally amicable nature. The treaty in question was concluded between Edward III and Ferdinand of Portugal, and provided that Portugal should join England (there was no «Great Britain» then), in warfare when called upon to do so. A commercial treaty was concluded with England in 1645 and renewed in 1652. These treaties had never been broken through the centuries. Again, in 1898, treaties were published in which neither party will help another nation in attacking the other party, and in case of war or invasion both powers agreed to assist each other when required.

In September 1914 was concluded the Anglo-American Treaty by which the contracting powers agree that «all disputes between them, of every nature whatsoever, other than disputes the settlement of which is provided for and in fact achieved under existing agreements. . . . shall, when diplomatic methods of adjustment have failed, be referred for investigation and report to a Permanent International Commission . . . and they agree not to declare war or begin hostilities during such investigation and before the report is submitted.»

In September 1914 the Allied Powers, Great Britain, France and Russia, signed a declaration that they would not conclude peace separately, and that no one of the Allies would demand conditions of peace without the previous agreement of each of the other Allies. Japan and Italy subsequently gave their full and complete adherence to this treaty of alliance (November 1915).

ALLIBONE, Samuel Austin, American bibliographer and librarian: b. Philadelphia, 17 April 1816; d. Lucerne, Switzerland, 2 Sept. 1889. For a time he engaged in mercantile pursuits; was book-editor of the American Sunday-School Union, 1867–73 and 1877–79; and in 1879 was appointed librarian of the Lenox Library, New York. He is best known by his 'Critical Dictionary of English Literature and British and American Authors' (3 vols., 1854–71), a monumental work that cost him 20 years of labor. It contains notices of 46,499 authors, with extracts from reviews of their works, and 40 classified indexes of subjects. It is an indispensable reference work for libraries and students. A supplement containing over 37,000 authors, by John Foster Kirk, appeared in two volumes, 1891. Others of Allibone's works are 'Poetical Quotations from Chaucer to Tennyson' (1873), containing 13,600 passages from 550 authors; 'Prose Quotations from Socrates to Macaulay' (1876), with indexes to the 8,810 quotations, and containing the

names of 544 authors and 571 subjects; 'Explanatory Questions on the Gospels and the Acts (1869); 'An Alphabetical Index to the New Testament' (1868); 'Indexes to Edward Everett's Orations and Speeches' (1859); 'Great Authors of All Ages: Selections'. (1880). New editions of the 'Prose Quotations' and the 'Poetical Quotations' appeared in 1893 and 1891 respectively.

ALLICE, or **ALLIS** (Fr. *alose,* from Lat. *alausa*), the larger European shad (*Alosa vulgaris*), about 20 inches long. There is but one other shad in Europe, the twaite. In the Rhine valleys both are called *mäifisch.* See SHAD; TWAITE.

ALLIED WAR COMMISSIONS TO THE UNITED STATES. Beginning in April 1917, a succession of conferences took place in the United States, the main objects of which were to co-ordinate the efforts of the Entente Allies and of the United States and to discuss the conduct of the war in Europe. The chief commissioners entrusted by their respective governments with such important duties were men of high distinction and ability; the conferences at Washington were supplemented by visits to many other cities; everywhere the commissioners were received with cordial demonstrations of enthusiasm; during the long voyages and land journeys no serious mishap occurred; and, finally, the results attained were pronounced both satisfactory in their immediate effect and of far-reaching importance for the future.

The first commissions to reach the United States were those from Great Britain and France. The British mission was composed of the Rt. Hon. Arthur James Balfour, foreign minister; Sir Eric Drummond; Ian Malcom, member of Parliament; C. F. Dormer and G. Butler, personal staff; Rear-Admiral Sir Dudley R. S. de Chair; Fleet Paymaster Vincent Lawfort; Major-General Bridges; Capt. H. H. Spender-Clay and Lord Cunliffe, governor of the Bank of England. In addition to the foregoing, James H. Thomas and Charles W. Bowerman, members of the House of Commons, were selected by Premier Lloyd-George to explain in detail the measures taken in Great Britain to solidify the labor resources. The personnel of the French mission was announced 18 April as follows: M. Viviani (Réné Viviani), former premier and minister of justice; Marshal Joffre; Vice-Admiral Chocheprat; Marquis de Chambrun, member of the Chamber of Deputies. Attached to the French mission were: M. Simon, inspector of finances; M. Hovelacque, inspector-general of public instruction. Members of Marshal Joffre's staff were: Lieutenant-Colonel Fabry, Lieutenant-Colonel Remond, Commandant Requin, Lieutenant de Tessan and Major Dreyfus. The British commissioners left England 11 April on a fast cruiser; arrived at Halifax 20 April; at the Canadian town of McAdams were welcomed by the American reception committee, headed by Assistant Secretary of State Long, Rear-Admiral Fletcher and Major-General Wood; and on 22 April arrived in Washington. The French mission crossed on a steamship of the French Line which was convoyed across the Atlantic. The safe arrival of the commissioners was announced 24 April. A permanent technical French commission to the United States which arrived in Washington 16 May had as its chief Capt. André Tardieu, French deputy and publicist, and its membership included several of the most eminent scholars of France. Six members of the Italian war commission reached New York 9 May, the other members arriving later in the month. The Italian envoys were: Prince Ferdinand of Savoy (Prince of Udine, cousin of King Victor Emmanuel); Senator Guglielmo Marconi inventor of wireless telegraphy; Marquis Luigi Borsarelli di Rio Freddo, under secretary of foreign affairs; Deputy Ciufelli, member of the Council of State and former minister of public instruction; Deputy Nitti, former minister of agriculture; Enrico Arlotta, financier and minister of maritime and railway transportation in the Italian cabinet; General Guglielmotti, representing the army; Commander Vannutelli, representing the navy; Aloise Bragadoni, of the transportation department; Cavalier G. Pardo, of the department of industry and commerce; and Cavalier G. Pietra, of the agricultural department. The departure of the French envoys was kept secret. They sailed from New York 15 May on the same steamer which brought them over; were convoyed by a French warship and reached Brest 23 May. The British envoys, after six weeks of conferences, crossed into Canada 25 May; and on 11 June Lord Northcliffe arrived in the United States, having been appointed as Mr. Balfour's successor in the American phase of war measures initiated by the British mission. On 16 June the Belgian war commission arrived. Its members were: Baron Moncheur, formerly Belgian minister to Washington; Maj.-Gen. Mathieu G. A. Leclerq; Count Louis D'Ursel; Maj. Leon Osterrieth, formerly military attaché of the Belgian legation at Petrograd; and Hector Carlier, a bank expert of international reputation. When greeting this mission, 18 June, President Wilson expressed America's "solemn determination that on the inevitable day of victory Belgium shall be restored to the place she has so richly won among the self-respecting and respected nations of the earth." On 19 June the Russian mission reached Washington. The members of this special embassy, in the order of their rank, were: Ambassador Boris A. Bakhmetieff; Lieutenant-General Roop, representative of the Russian army; Professor Lomonosoff, member of the Council of Engineers and representative of the ministry; Professor Borodine, representative of the ministry of agriculture; M. Novitzky, representative of the ministry of finance; M. Soukine, first secretary of legation, ministry of foreign affairs; Captain Dubassoff of the guard, aide-de-camp; and Captain Chutt. Less than one month afterward the Japanese commission reached the Pacific coast of the United States. The chief envoy was Viscount Kikujiro Ishii, formerly the foreign minister of the Japanese empire. Other members of the commission were: Vice-Admiral Isam Takeshita, formerly naval attaché of the Japanese embassy at Washington; Maj.-Gen. Shoichi Sugano; Matsuzo Nagai, secretary to the foreign department; Capt. Shokyo Ando; Maj. Seiji Tamakawa and Tadanao Imai, the secretary. Viscount Ishii's first formal and comprehensive statement concluded with the words:

"Let us see together with a clearer vision the pitfalls dug by a cunning enemy in our path; let us [the United States and Japan] together fix our eyes upon the star of principle which shall lead us together most surely to a participation in the triumph of the right, to a certain victory in the greatest and, let us hope, the last great war in human history. And when that victory shall have been won, let us together help in the upbuilding of a new world, which shall rise, fair and strong and beautiful, from the ashes of the old." With the arrival of the Japanese commission in Washington, 22 August, and its subsequent visits to New York and other cities of the eastern seaboard, the series of conferences which we are recording reached the point at which initial gains in the international arrangements for co-ordination of the efforts of the principal Entente Allies may be noted. The measures actually adopted or tentatively decided upon included: The granting of huge loans to the Allies; the sending of troops of the United States (in the first instance a division of regulars, with a regiment of marines and nine regiments of engineers, under command of Major-General Pershing) for service in France; adherence to and full co-operation with the British blockade system; the expediting of the American ship-building program, and the turning over of seized German ships to France, Italy and Russia; the provision made for a system of joint food-control with the Allies; the diplomatic arrangements for the granting to the Allies of preferential treatment in commerce and for harmonious action in many specified matters of international importance, including ultimately policies and developments relating to the Pacific as well as to the Atlantic. During the summer and autumn of 1917 the United States also received visits from commissions representing the neutral nations, Norway, Switzerland, Holland, as well as those representing belligerent nations identified with the cause of the Entente Allies, rather as participants than as leaders. In January 1918 the Serbian commission visited Washington and other cities, and was well received.

ALLIER, ál-lē-ā, France, a central department intersected by the river Allier and partly bounded by the Loire; surface diversified by off-sets of the Cevennes and other ranges, rising in the south to over 4,000 feet and in general richly wooded. It has extensive beds of coal as well as other minerals, which are actively worked, there being several flourishing centres of mining and manufacturing enterprise; mineral waters at Vichy, Bourbon, L'Archambault, etc. Large numbers of sheep and cattle are bred. Area, 2,822 miles. Capital, Moulins. Pop. 500,000.

ALLIER, a river of France, tributary of the Loire, rising in the department of Lozère and flowing northward about 200 miles through Lozère, Upper Loire, Puy de Dôme and Allier.

ALLIGATOR, the name of a genus of crocodilian reptiles derived form a corruption of the Spanish *el lagarto,* "lizard," from the Latin *lacertus,* a lizard. Alligators differ from crocodiles mainly in having relatively short and broad snouts and by the circumstance that as a rule the first and fourth tooth on each side of the lower jaw enter into pits in the upper jaw, whereas those of crocodiles slide outside of the jaw and are visible. The caymans of South America may be included in the general term. These reptiles are confined mainly to the rivers of the New World, in which they typically represent the crocodiles of the eastern hemisphere, but there is one species in China (*Alligator sinensis*) first made known in 1879, and resembling the South American species. The best-known species are the alligator of the Southern States (*Alligator mississippiensis*); the cayman of Surinam and Guiana (*A. palpebrosus*), and the spectacled alligator (*A. sclerops*), found in Brazil. In the water a full-grown alligator is a formidable animal, on account of its great size and strength. These reptiles swim with wonderful celerity, impelled by their long, laterally-compressed and powerful tails. On land their motions are proportionally slow and embarrassed, owing to their weight, the shortness of their legs and generally unwieldy proportions. It grows to the length of 15 or possibly 20 feet, and is covered above by a dense armor of horny scales.

Under the throat of this animal are two openings or pores, the excretory ducts from glands which pour out a strong, musky fluid, giving the alligator a peculiarly unpleasant smell. In the spring of the year, when the males are under the excitement of the sexual propensity, they frequently utter a loud roar, which, from its harshness and reverberation, resembles distant thunder, especially where numbers are at the same time engaged. At this period frequent and terrible battles take place between the males, which terminate in the discomfiture and retreat of one of the parties. The females make their nests in a curious manner, on the banks of rivers or lagoons, generally in the marshes, along which, at a short distance from the water, the nests are arranged somewhat like an encampment. They are obtuse cones four feet high and about four feet in diameter at the base, built of mud and grass. A floor of such mortar is first spread upon the ground, on which a layer of eggs, having hard shells and larger than those of a common hen, are deposited. Upon these another layer of mortar, seven or eight inches in thickness, is spread, and then another bed of eggs; and this is repeated nearly to the top. From 100 to 200 eggs may be found in one nest. It is not ascertained whether each female watches her own nest exclusively or attends to more than her own brood. It is unquestionable, however, that the females keep near the nests and take the young under their vigilant care as soon as they are hatched, defending them with great perseverance and courage. The young may be seen following the mother through the water like a brood of chickens following a hen. When basking in the sun on shore, the young are heard whining and yelping about the mother, not unlike young puppies. In situations where alligators are not exposed to much disturbance the sites of the nests appear to be very much frequented, as the grass and reeds are beaten down for several acres around. The young, when first hatched, are very feeble and helpless, and are devoured by birds of prey, soft-shelled turtles, etc., as well as by the male alligators, until they grow old enough to defend themselves. As the eggs are also eagerly sought by vultures and

other animals the race would speedily become extinct but for the great fecundity of the females.

The alligator is generally considered as disposed to retire from man, but this is only where they are frequently disturbed. In situations where they are seldom or never interrupted they have shown a ferocity and perseverance of the most alarming character in attacking individuals in boats, rearing their heads from the water and snapping their jaws in a threatening manner. At present alligators, though still numerous in the remoter parts of Florida and Louisiana, are no longer regarded as very dangerous. Their numbers annually decrease and at no distant period they must be nearly, if not quite, exterminated. In the winter the alligators spend a great part of their time in deep holes, which they make in the marshy banks of rivers, etc. They feed on fishes, reptiles, small quadrupeds (dogs if they can get them) or carrion, and though very voracious are capable of existing a long time without food. Compare CROCODILE; and see CAYMAN; JACARE.

ALLIGATOR-APPLE. See CUSTARD-APPLE.

ALLIGATOR-FISH, one of the *Agonidæ,* a family of fish whose slender bodies are armored by large bony plates. One species 12 inches long (*Podothecus acipenserinus*) is found on the northern Pacific coast.

ALLIGATOR-GAR, the immense greenish colored gar (*Litholepis tristœchus*) found in the Southern States and southward through North America, and sometimes measuring 10 feet. See GAR.

ALLIGATOR-LIZARD, any member of the genus *Sceloporus,* which, although iguanid, has many small species without the typical iguanid characteristics. They abound in Mexico and the southwestern United States, and one species (*Sceloporus undulatus*) is the familiar "fence lizard" of the colder States. Though often inconspicuously colored on the back except for black crosslines, the throat and inferior surfaces are generally striking in color, and frequently there are light lines along the sides. They are often ignorantly called poisonous, but all are harmless.

ALLIGATOR-PEAR, or **AVOCADO,** a tree, *Persea gratissima,* of the family *Lauraceæ,* indigenous to subtropical and tropical America and widely cultivated in warm countries for its more or less pear-shaped, purple- or green-skinned fruits, each of which contains a single seed embedded in a yellowish-green edible marrow-like pulp. Wherever it grows the alligator-pear is highly prized as a salad and is usually served with pepper, salt and vinegar, or with wine and spice, but natives of temperate climates usually have to acquire a taste for it. It is rich in oil, which may be used in soap-making and in lighting. The seeds yield a black dye. Seedlings are easily raised and begin to bear in about five years if planted in good soil in warm places, but they are usually improved by budding from selected stock. Except in southern Florida and southern California the avocado-pear does not produce palatable fruit in the United States. The American market, therefore, which is limited to the larger cities, has been mainly supplied from Hawaii, Mexico and the West Indies. In recent years many trees have been planted in Florida and southern California, which have yielded a superior quality of fruit which is constantly finding a wider market. The fruit is sometimes called midshipman's butter and aguacate.

ALLIGATOR-TERRAPIN, -TORTOISE, or **-TURTLE,** the snapping-turtle; more particularly, a very large species (*Macrochelys lacertina*) which is eaten and esteemed as a delicacy in the lower valley of the Mississippi. It sometimes weighs 50 pounds.

ALLINGHAM, William, Irish poet; b. Ballyshannon, Ireland, 19 March 1824; d. Hampstead, 18 Nov. 1889. From 1846 to his retirement in 1870 he held various posts in the Irish customs service. He was sub-editor of *Fraser's Magazine,* 1870–74, when he succeeded James Anthony Froude as editor, and conducted it with ability until 1879. At its best Allingham's poetry is excellent, being simple, clear and graceful, and whether pathetic, sportive or descriptive is always characterized by delicate artistic expression. His best work is in the volume called 'Day and Night Songs' (1854). 'Laurence Bloomfield in Ireland' (1864), a long poem which has been called "the epic of Irish philanthropic landlordism," has a wealth of fine description, but was not a public success. Other volumes are 'Poems' (1850), 'The Ballad Book' (1864), 'Songs, Ballads and Stories' (1877), 'Collected Poetical Works' (6 vols., 1888–93).

ALLISON, William Boyd, American legislator: b. Perry, Ohio, 2 March 1829; d. 4 Aug. 1908. A farmer's son, he received his education at Allegheny College, Pennsylvania, and at Western Reserve College, Ohio. He practised law in his native State till 1857, when he removed to Dubuque, Iowa. A Republican and trusted local leader, he was sent as a delegate to the Republican national convention in Chicago in 1860, which nominated Lincoln. In the early part of the Civil War he served on the governor's staff, and was actively engaged in raising troops for the Union army. In 1863 he was elected to Congress and served by successive re-elections till 1869; on 4 March 1873 he was elected to the United States Senate, and was five times re-elected, in 1878, 1884, 1890, 1896 and 1904, his many years of service making him one of the oldest as he has always been one of the most influential leaders. He has served on many important committees; and as chairman of the finance committee in 1878 was the chief author of the bill that committee reported for the purchase of silver bullion, known as the Bland-Allison Act (see BLAND SILVER BILL), a compromise from the free-coinage bill of Congressman Bland. He was repeatedly a strong candidate in Republican national conventions for the Presidency; and was offered the secretaryship of the treasury by both Garfield and Harrison. In 1892 he was a representative of the United States at the Brussels Monetary Conference.

ALLITERATION, the succession or frequent occurrence of words beginning with the same consonant. In the older Scandinavian,

German and Anglo-Saxon poetry it served instead of rhyme. It is found in early English poetry with the same function. As thus used it had a certain regularity of accent and emphasis. In 'Piers Plowman' the line is constructed with two hemistichs, the former with two words beginning with the alliterative letter, and the latter with one, thus:

"Her robe was full rich with red scarlet engreyned."

The poetry of widely separated nations exhibits this device, it being found both in India and in Finland. It still remains in Icelandic poetry. Early in the 17th century English writers ran to great extravagance in the use of alliteration, both in prose and poetry. It is said that preachers from their pulpits addressed their hearers as "chickens of the church" and "sweet swallows of salvation." No other device of composition so easily lends itself to fanciful conceits or ingenious trifling. The ease with which devices may be marshaled would hardly tend to make the ordinary reader appreciative of Churchill's description of himself as one

"Who often, but without success, had prayed
For apt alliteration's artful aid."

But the couplet itself is a striking proof of its own truth, for it shows that the poet did not know what alliteration is: it must be of consonants, not vowels, and even so his *a*'s are alike only to the eye, not the ear. All good poets have used it to lend musical beauty or emphasis to their verse, though it can be overused or misused. Following are a few from the chief American poets:

"And the *s*park *s*truck out by that *s*teed in his *fl*ight
Kindled the land into *fl*ame with its heat."
LONGFELLOW.

"It carves the *b*ow of *b*eauty there,
And the *r*ipples in *r*hymes the oar forsake."
EMERSON.

"Of *w*ailing *w*inds, and naked *w*oods."
BRYANT.

"And *h*ark! *h*ow clea*r* bold chanticleer,
*W*armed with the new *w*ine of the year."
LOWELL.

"*S*tole with *s*oft *s*teps the shining *s*tairway through."
HOLMES.

"What a *t*ale of *t*error now their *t*urbulency *t*ells!"
POE.

"Across the *m*ournful *m*arbles play."
WHITTIER

ALLIUM, a genus of about 300 perennial, rarely biennial, bulbous herbs of the family *Liliaceæ*, mainly indigenous to the colder parts of the northern hemisphere. The leaves are generally long and narrow, often, however, cylindrical and hollow; the flowers in umbels, often with bulblets among them. Many of the species are economically important; for instance, *Allium cepa*, the onion; *Allium sativum*, garlic; *Allium porrum*, leek; *Allium ascalonicum*, shallot; *Allium schœnoprasum*, chives; *Allium scorodoprasum*, rocambole, each of which is treated separately under its common name. Several uncultivated members of the genus are also used as food in countries where they grow wild. *Allium vineale*, wild onion or wild garlic, a European species introduced into the United States, is a troublesome weed, especially in New England pastures, since it imparts a strong flavor of garlic to the milk of cows feeding upon it. (See GARLIC). Many species are natives of the United States, but none of them have been cultivated for food; some, however, are planted for ornament. Perhaps the most common eastern species are *Allium cernuum*, *Allium canadense* and *Allium tricoccum*, the last generally known as the wild leek, a broad-leaved species which grows in moist woods, from Maine to North Carolina and westward to Wisconsin. Some of the hardy species are grown for ornament in gardens; for example, *Allium moly* and *Allium roseum*, from Europe; *Allium victorialis*, from Siberia; *Allium acuminatum*, from the Western States. Others, especially *Allium neapolitanum*, a tender European species, are often grown in greenhouses.

ALLMERS, Hermann Ludwig, ăl-merss, hĕr'man lŭt'vik, German poet and author: b. Rechtenfleth, 11 Feb. 1821; d. 1902. His 'Idle Days in Rome' (1869; 9th ed. 1896) was widely read. Others are: 'Captain Böse' (1882); 'Fromm und Frei' (1889), a volume of religious poems; 'From an Old and Young Past Time' (1895); 'Collected Works' (6 vols., Oldenburg 1891–95). Consult Bräutigram, L., 'Der Marschendichter Hermann Almers' (1891).

ALLMOUTH, a fish. See GOOSEFISH.

ALLOA, ăl'lōa, a river port of Scotland, on the north side of the Forth, five miles from Stirling, in the county of Clackmannan. It is irregularly built, but contains some good streets and buildings, including the parish church, the county court house, the town hall and the public baths. It carries on several manufactures, chief of which are ale, whisky, woolen yarn and bottles. There are some large collieries in the neighborhood. Alloa has an excellent harbor, from which it exports coal, ale and fire-brick, and imports timber, hemp, oak-bark, grain, etc. The river is here crossed by a viaduct of the North British Railway. There is an ancient tower in the vicinity, once the residence of the Erskine family. Pop. 17,200.

ALLOBROGES, the name of a people who lived in ancient Gallia Narbonensis and occupied the country below the Lake of Geneva and the Rhone, now included in Savoy and the French province of Dauphiné. They long struggled for their independence against the Romans, but were finally subjugated by Fabius Maximus.

ALLOCUTION, an address, a term particularly applied to certain addresses made by the Pope to the cardinals.

ALLODIUM ("without vassalage"). Applied to lands, allodium, or allodial tenure, signifies an estate held by absolute ownership, without regarding any superior to whom any duty is due on account thereof. The title to land in the United States is essentially allodial, and every tenant in fee simple has an absolute and unqualified dominion over it; still, in technical language, his estate is said to be in fee, a term implying a feudal relation, although such a relation has ceased to exist in any form, while in many of the States of the Union the lands have been declared to be allodial.

ALLOGAMY, the transfer of the pollen of one flower to the pistil of another. When the pollinated flower is on the same plant the process is known as geitonogamy, and when on a different plant it is known as xenogamy.

Allogamy is the opposite of autogamy, or self-pollination. See POLLINATION.

ALLON, Henry, English Congregational clergyman: b. Welton, 13 Oct. 1818; d. London, 16 April 1892. He was educated at Chestnut College. From 1844 until his death he was minister of Union Chapel, Islington. He was chairman of the Congregational Union 1864 and 1881. He compiled a hymnbook widely used in his denomination. He also compiled anthem books. He was the author of 'The Life of Rev. James Sherman' (London 1863). He edited the *British Quarterly Review,* 1865–87. His life has been written by his successor, W. H. Harwood.

ALLOPATHY. See THERAPEUTICS.

ALLOPHANE, al'ō-fān; from the Greek *allos,* "other," and *phanos,* "appearing," in allusion to its change of appearance before the blowpipe, a native silicate of aluminum, having the formula $Al_2SiO_5+5H_2O$, and occurring in thin, amorphous, brittle incrustations, with a hardness of 3. and a specific gravity of about 1.87. It is found in a great variety of colors, due to the presence of other minerals. In the United States it occurs in Massachusetts, Connecticut, Pennsylvania and Tennessee.

ALLORI, ăl-lō'rē, a family of artists who flourished during the 16th century in Florence. The best of them was ANGELO (or Agnolo) DI COSIMO ALLORI (b. Monticelli, near Florence, about 1502; d. 1572). Like his nephew ALESSANDRO (b. Florence 1535; d. 1607), he was surnamed Bronzino, and both are more often spoken of by this name than by that of their family. The third Allori to attain eminence as a painter was the son of Alessandro — CRISTOFANO (1577–1621), who is also, though less frequently, referred to as Bronzino. Angelo studied mainly under Raffaelino del Garbo and Jacopo Carrucci (Pontormo). The latter, greatly attached to his pupil, associated him in the work of painting some of his most important decorations, notably the ceiling of the Medicean chapel of San Lorenzo, which Bronzino completed after Pontormo's death. A friendship with Vasari, biographer of the Italian painters, was one of the factors on Bronzino's coming under the influence of Michelangelo. He does not succumb to it to the extent that his nephew Alessandro did — the latter must be classed as one of Michelangelo's imitators. Angelo, with all his classical study, preserved a racy force of observation that gives to his famous portraits of the Medici family, like the famous 'Cosimo I' in the Pitti Gallery, Florence, or better yet, those of the Panciaticchi family, their living appearance and their dignity. The fineness of his draughtsmanship — an example being the 'Venus' of the National Gallery, London — one of the high points of the later Florentine school, is stiffened and hardened by his nephew and pupil Alessandro, who marks the beginning of the rapid decline of Florentine painting. In the hands of Cristofano it is little better than academic and sentimental. The 'Judith' in the Pitti Palace is the finest and best known work by Cristofano.

ALLOSAURUS, an extinct carnivorous dinosaur of gigantic size, inhabiting North America during the Jurassic Period. It was one of the largest of flesh-eating animals, exceeding 30 feet in length, and comparable with an elephant in bulk. The animal was a biped with long hind legs, small fore legs not reaching the ground and long massive tail. The jaws are three feet long, with pointed, sharp-edged teeth, and the toes armed with large sharp claws, those of the fore foot being especially powerful. The hind feet somewhat resemble those of birds. Fossil skeletons of herbivorous dinosaurs frequently show deep scratches and scorings on the softer edges of the bone, and broken-off teeth of Allosaurus are very often found associated with them, showing that this animal preyed on the carcasses of his huge herbivorous contemporaries; it was well adapted also by its teeth and claws to attack them when alive, and was probably their especial foe. See DINOSAUR.

ALLOTROPY, a-lot'rō-pi, or **ALLOTROPISM** (from the Greek *allos,* "another," and *tropos,* "manner"), the property exhibited by certain substances of existing in two or more different states distinguished from each other by different properties. The most familiar case of allotropy is afforded by carbon, which exists in a number of allotropic modifications, of which charcoal, graphite and the diamond are familiar examples. Allotropy is not exhibited by the metals to any marked degree (see, however, SILVER). Sulphur exhibits many allotropic forms, of which the following are the best known: (1) It occurs in rhombic crystals, having a specific gravity of 2.07, melting at 235° F., and soluble in carbon disulphide; (2) in monoclinic crystals, having a specific gravity of 1.96, melting at 243° F., and soluble in carbon disulphide; (3) in an amorphous plastic state, insoluble in carbon disulphide; (4) immediately above its melting point it is thin, clear and amber-colored; (5) at about 400° F. it becomes thick and dark; and (6) at about 650° F. it is again thin, but remains dark.

Ozone is a familiar allotropic form of oxygen, produced when the silent electric discharge is allowed to act upon oxygen. It is known that the molecule of oxygen contains two atoms, and that the molecule of ozone contains three atoms. This suggests that allotropy, in all cases, may be due to a similar change in the number of atoms present in a molecule; but so little is known of the ultimate structure of solids and liquids that speculation of this sort is of no great value.

Most of the non-metallic elements have allotropic modifications, and remarkable cases of allotropy are observed among chemical compounds. In the case of a compound, two states of a substance having the same chemical composition are said to be isomeric when their constituents are combined by different modes of atomic linkage; and they are said to be allotropic when the kind of atomic linkage is the same in both cases. See ISOMERISM.

ALLOUEZ, ä-lö-ā', **Claude,** French Jesuit missionary and explorer: b. France 1620; d. near the St. John's River, in the present State of Indiana, 1689. He is called "the founder of Catholicity in the West." He preceded and was a coworker of Marquette. For 32 years he labored among the Indians. He preached to 20 different tribes and is said to have baptized 10,000 neophytes. He traveled over a wider territory than any of the missionaries of his day and reached the western end of Lake Superior.

At times he had to prevent the Indians from adoring him as a god; at others, they were about to sacrifice him to their Manitou. Consult Parkman, 'La Salle.'

ALLOWAY, a parish of Scotland, now included in Ayr parish. Here Burns was born in 1759, and the "auld haunted kirk" near his birthplace was the scene of the dance of witches in 'Tam o' Shanter.'

ALLOXAN, a-lok'san, a substance produced by the action of dilute nitric acid upon uric acid, and having the formula $C_4H_2N_2O_4$. It is freely soluble in water and crystallizes in the trimetric system when a saturated solution is allowed to cool, and in monoclinic prisms when deposited by evaporation from a warm solution. It is converted into alloxantin ($C_8H_4N_4O_7$) by the action of $SnCl_2$ and other reducing agents, and into alloxanic acid ($C_4H_4N_2O_5$) by the action of the fixed alkalis. Ammonia combines with it to form murexid, a substance that was used about the middle of the 19th century for dyeing silk and wool purple and red, but which was soon displaced by the aniline colors.

ALLOYS. In the commercial sense of the term an alloy is a combination of two or more metals which have been melted together. In a scientific sense, however, the term has a restricted meaning. It signifies a chemical combination analogous to the common solution of a chemical salt in water; only, in the case of two metals in alloy, each is to be regarded as dissolved in the other. As an illustration of the conditions existing in an alloy let us consider a solution of common salt in water. In 100 parts of water at 65° F. common salt may be dissolved in any proportions from one part (or less) up to 26.4 parts — at which point the solution is said to be "saturated." In every possible proportion between those limits the solution is entirely homogeneous. If more salt be added, it does not dissolve but remains in the solution as a mere mixture of salt with a solution of salt. In the case of a two-metal or binary alloy the two metals may be designated as A and B. The metal having the highest melting point is fused first, and the other is then added. Suppose B to be added to A in this manner. Up to a certain saturation point B dissolves freely in A. Beyond that point, if still more of B is added, a new combination will be found present in the alloy, namely, a solution of A in B. The alloy at that point is a mixture of the two solutions in varying proportions, depending upon the amount of B which has been added beyond the saturation point. With a still further addition of B a larger proportion of the solution A-in-B prevails in the alloy, and, continuing the process, the solution B-in-A disappears from the alloy, and it becomes a homogeneous solution of A in B.

These considerations relate to alloys in a molten state, at the temperature of the melting point of the most refractory constituent. As the temperature falls toward the point where the alloy becomes solid, several changes may be noted as taking place in its constitution, depending upon the proportions and conditions of solution of both A and B. The alloy A-in-B may separate out, generally in a crystalline form, or the alloy B-in-A may separate out. The condition of the mass is then one analogous to curdled milk. That combination of the two metals which has the lowest melting point is the last to solidify as the cooling continues, and this is called the eutectic of that alloy. But, in the process of cooling, other changes may have taken place. In the solution B-in-A B may have crystallized out if it was close to its saturation point, and a similar action may have occurred as to A-in-B. Further complexities arise from the fact that when an alloy has become solid it has not always become stable. With the lapse of time changes are continually taking place either toward greater stability on the one hand, or toward dissolution on the other. Some alloys give evidence of these changes within a brief period. Others show them only after several years. Much has been learned about the constitution of alloys with the microscope, but this form of research has been limited in practice to the temperatures which normally prevail. Attempts to use the microscope on hot alloys have so far proved unsuccessful. For microscopic work the face of a thin slice of the alloy is very carefully and gently polished, and it is then delicately etched with an appropriate acid which serves to reveal many of the details of internal constitution. (See METALLOGRAPHY). Although it has not been adequately determined whether the fusion and admixture of different metals takes place in some relation to their atomic proportions, or else in some other definite ratio, yet the composition of natural alloys such as doré or electrum, which consists of variable proportions of gold and silver, as well the fact that, as a rule, alloys more readily melt than either of their constituent metals, are circumstances that have given rise to a widespread conviction or belief that nature really does combine them by some law which is as yet undiscovered. Among the many alloys whose density is less than the average density of their constituent metals may be mentioned gold with either silver, copper, iridium, nickel, iron or lead; silver with copper; and iron with antimony, bismuth or lead. Among those whose density is greater than the mean of their constituents is gold with antimony, bismuth, cobalt or zinc.

Another fact, and one of practical importance to the manufacturer, is that an alloy, when remelted, even if composed of only two metals, will not exhibit the same characteristics as at first. A malleable alloy may become brittle, a ductile alloy unworkable, etc. This metamorphism is even more marked when the remelted alloy is composed of several metals. The ordinary remedy employed for this defect is to add more raw metal; but this has to be done with great care as to proportions, which can only be ascertained by experiment. Skill in the remelting of scrap often constitutes a valuable trade secret, such as for a long period was the case with German silver, tombac, Jemmapes brass and other then popular alloys.

Fusion of metals to make an alloy is not the only method to produce such a result. Another method much in use, especially in the fine arts, is the electrolytic method. The metals to be combined are placed in the form of water solutions in the electrolyte and the current plates then in alloy upon the objects attached to the cathode. In this way jewelers produce the "red gold," "green gold"

and "gold" of other intermediate tints in alloys of gold, silver and copper from an electrolytic bath. Other means of producing alloys are by pressure upon the mixed powders of the metals, or by the intimate mixtures of their vapors, but these are employed only in laboratory investigations. Gold and quicksilver will coalesce and form a natural alloy or amalgam at ordinary temperatures the moment they touch each other, a fact of the highest importance in gold mining. Discovery of this circumstance and its employment as the "amalgamation process" is commonly credited to a Spanish miner named Bartolomeo Medina of the 16th century (1557). In point of fact, it was known to the Arabs, Romans and Greeks, indeed is of the highest antiquity. It was commonly employed as a means of recovering gold from auriferous gravel or sand by the Arabian miners and metallurgists of the Middle Ages; the source whence both the Spaniards and Portuguese got it. There exist unquestionable evidences of its employment in Spain and Portugal centuries before Medina's time. These evidences are brought together in a 'History of the Precious Metals' (New York 1904, p. 134). Medina's claim was in fact a claim on behalf of the Fuggers, who farmed and monopolized the Almaden quicksilver mines of Spain, and thus held the American gold and silver mines in subjection. The process which may have been discovered by Medina is the "patio process," a complicated metallurgy, in which the amalgamation of gold and quicksilver plays but a subordinate part.

To Make a Metallic Alloy.— The first consideration is the temperature at which the metals will melt in the furnace. This is as follows for various metals, in degrees Centigrade: Mercury (quicksilver), —39.4; phosphorus, 44; sulphur, 114.5; tin, 231.68; bismuth, 268.3; tellurium, 282; cadmium, 320; lead, 330 to 335; zinc, 419; arsenic, 450; antimony, 629.5; magnesium, 632.7; aluminum, 654.5; silver, 960.5; gold, 1061.7; copper, 1080.5; silicon, 1100 to 1300; nickel, 1400 to 1450; iron, 1550 to 1600; platinum, 1775, and manganese, 1800 to 1900. Ordinarily when the melting points of the constituents of the proposed alloy are nearly equal, the alloy is made by fusing first the metal which has the higher melting point and adding the other to the molten mass. When the melting points are widely apart a difficulty may be encountered in the vaporizing of one of the constituent metals at the fusing point of the other. In this case it becomes necessary to form preliminary alloys which are afterward combined. As an illustration, German silver may be instanced. This is an alloy of nickel, copper and zinc. The nickel melts at 1450°, at which temperature zinc would turn to vapor. So an alloy of nickel and copper is first made and then a brass of copper and zinc. The copper-nickel alloy has a much lower melting point than pure nickel and the brass has a higher melting point than zinc. The two preliminary alloys are then fused together without the loss of the zinc. Oxidation during the fusing process is a serious obstacle in producing some alloys. This may be obviated by the use of a flux, like borax; or by metallic deoxidizers, like powdered aluminum, which not only reduce the oxides but increase the fluidity of the mass and therefore the intimacy of the mixture. Great care is needed also in the pouring (casting) of the alloy at just the right temperature. If the heat be too great the structure will be coarse-grained; if the degree is too low the less fusible constituents are liable to crystallize out and the ingot be unsound and crack under working. The rate at which the cooling after pouring is permitted to take place is also of prime importance. Slow cooling produces a weak alloy of coarse structure; quick cooling yields a strong alloy of fine-grained structure but inclined to be brittle. The molds employed must be of material suited to the prospective alloy. They are usually of iron, brass, iron and sand, sand and clay, or plaster of Paris. Most alloys are subjected to after-treatment with heat and cold, as in annealing, chilling, tempering, etc., and by mechanical processes, as hammering, rolling, etc. A remarkable circumstance concerning alloys is that a very small proportion of another element will often entirely alter the character of a metallic composition. One part of carbon in 2000 of iron will convert it into steel; the same minute proportion of tellurium in bismuth converts it into a finely crystalline metal; one part of phosphorus in copper will make it hot-short; while the same almost negligible proportion of bismuth will destroy its usefulness for many purposes for which, when rid of this intrusion, it is eminently fitted.

The supreme importance of the alloys in the arts is apparent when it is considered that very little of the vast quantities of metal used in civilized life is the pure metal. Steel is an alloy of pure iron and carbon, and other metals are added in alloy to produce the higher grades of steel — chrome steel, manganese steel, nickel steel, tungsten steel, vanadium steel, etc.; cast iron is an alloy of pure iron with carbon, sulphur and phosphorus; commercial tin is an alloy of pure tin and lead; commercial gold and silver are alloys of these precious metals with others to add the required hardness to withstand wear; the brasses are alloys of copper and zinc; the bronzes are alloys of copper and tin, with other metals added; etc. Although many of these alloys have been long known, yet newer and often valuable combinations of the same metals are daily discovered, which are better adapted than the older ones for the new uses which practical engineering and processes demand.

A beautiful and useful alloy of gold 78 and aluminum 22, carrying a rich purple shade, is now employed in the manufacture of jewelry, which formerly consisted of a gold, silver and copper combination. An alloy of silver 25 and aluminum 75 furnishes a metal adapted for the manufacture of fine instruments, electrical apparatus, dentists' tools, etc. It makes delicate castings and takes on a fine polish. The combinations with copper are more important.

Aluminum Bronze is a combination of copper 89 or 90, with aluminum 11 or 10 per cent. Although hard, it can be readily soldered. It can be rolled into thin sheets, worked with the hammer and stamped into form. Its color resembles that of American gold coin, and it is susceptible of high polish. With copper 95 and aluminum 5 the combination resembles pure gold very closely.

Boron Bronze.— Into a fused admixture of fluorspar and vitrified boric anhydride,

aluminum is introduced, when reduction takes place and this result when combined with a copper admixture in the proportions of the prepared aluminum 5 to 10 and copper 95 to 90 per cent renders an alloy denser, more durable and less brittle than aluminum bronze; and furnishes more uniform and delicate castings. The aluminum-copper alloys with 90 to 93 aluminum and 10 to 7 copper yield a metal of great tensile strength, largely employed in the manufacture of automobile and aeroplane parts.

Aluminum Brass is an alloy with an elastic limit up to nearly 15 tons to the square inch, the aluminum imparting to the brass greater fluidity in casting and additional tensile strength. For these reasons it is extensively used for electrical purposes. A small proportion of aluminum with cast iron, wrought iron or steel has resulted in alloys of commercial value. From 1 to 2 per cent aluminum to castings of iron will cause the metal to flow more leisurely and take on a closer grain. In steel castings the proportion of aluminum commonly used is minute, about 1/50th to 1/30th of 1 per cent, although for certain steel castings this has been advantageously increased to 1 and even 2 per cent of aluminum. The latter adds tensile strength and homegeneity to the alloy, gives it a smoother surface and lessens its liability to oxidation. An alloy of aluminum 70 and zinc 30 has been found useful in casting frames for sewing machines and like small manufactures. A combination of aluminum 80, zinc 15, tin 2, copper 2, and ½ each of manganese and iron is an alloy in which the aluminum is hardened and the product becomes applicable to many useful manufactures.

Aluminum Zinc, composed of zinc 90 to 95 and aluminum 10 to 5, is used in the galvanizing bath and treated the same way as pure zinc, except that no sal-ammoniac is used for clearing out the oxide, the aluminum being sufficiently effective.

Anti-Friction Alloys.— This name is given to those alloys which are sufficiently plastic under the pressures to which they are subjected in bearings to mold themselves to the shape of the shaft which they support and still hard enough to stay in place. This property of fitting to the shaft is of course approximate, for in fact the shaft and its bearings are always separated by a thin film of oil. These anti-friction metals are generally alloys of tin with tin-antimony and tin-copper; or they may be of lead compounded with tin-antimony or of lead and tin so compounded. The first of these anti-friction alloys was the famous Babbitt metal, now almost wholly superseded by more effective combinations. See ANTI-FRICTION METALS.

Coinage Alloys.— The coinage of gold and silver dollars and multiples or fractions thereof, as first authorized by the act of Congress passed 2 April 1792, provided that the gold dollar should contain 27 grains of gold 916⅔ fine. The amount of fine gold in the dollar was therefore 24¾ grains. The silver dollar was ordered to contain 416 grains of silver, 892.4 fine, or 371.24 grains of fine silver. By the act of 28 June 1834 the gold dollar was reduced to the weight of 25.8 grains, 900 fine, or 23.22 grains fine gold. No change was made in either the weight or alloy of the silver dollar. By the act of 18 Jan. 1837 the alloy, but not the fine contents, of the silver dollar was changed. It was thenceforth to contain 412½ grains of silver, 900 fine, or 371¼ grains of fine silver; practically the same contents of fine silver as before. No further change was made in the gold dollar. The alloy of both gold and silver coins has always been of copper, although a minute quantity of silver has at times been introduced into the gold coin alloy, rather to improve the color of the coins, than from any design to increase their bullion value. By the act of 21 Feb. 1853 important reductions were made in the weight and fineness and therefore in the alloy of the subsidiary coins; a subject that belongs less to alloys than to coins. The current five-cent coins, or "nickels," are an alloy of 75 per cent copper and 25 per cent nickel. The "copper cent" is an alloy of copper, 95 per cent and zinc and tin, 5 per cent.

Heusler Alloys, the group of ferromagnetic manganese alloys, named after F. Heusler, who discovered them in 1898. In addition to manganese or manganese-copper, these alloys contain one or more of the elements aluminum, antimony, arsenic, bismuth, boron, and tin. The aluminum-manganese-copper alloys show the largest degree of ferromagnetism, about one-third that of the purest soft iron. The ternary tin-manganese bronzes also exhibit marked ferromagnetism. Manganese-tin is magnetic and remains so when copper is added. Manganese-copper is non-magnetic, but becomes magnetic when tin is added. Research has determined in the case of the aluminum-manganese bronzes that the chemical compound carrying the magnetism is expressed by the formula $Al_2(Mn,Cu)_4$. This seems to establish the fact that ferromagnetism is a molecular phenomenon due to a condition of definite chemical combination. See FERROMAGNETISM.

Pyrophoric Alloys.— The alloys distinguished by the title "pyrophoric" have the peculiarity of emitting hot sparks when rasped off with a coarse file. They consist of the cerium group of rare earth metals in alloy with iron, nickel, manganese or cobalt. They exhibit the same property in a less degree with cadmium, zinc, tin and lead. The common form of pyrophoric alloy used in automatic gas lighters contains 35 per cent of iron and 65 per cent of the cerium metals. These alloys may, however, range in constitution from 10 per cent iron to 65 per cent iron. The pyrophoric property of these alloys is utilized in gunnery, the alloy being set into the shell of the projectile. The friction due to the rapidity of passage through the air is sufficient to ignite the alloy, thus marking the flight of the projectile by a trail of sparks.

See also ALUMINUM; AMALGAM; BRASS; BRONZE; FUSIBLE METALS; STEEL; and paragraphs on *Alloys* under the titles of the different metals.

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RICHARD FERRIS,
Editorial Staff of The Americana.

ALLSPICE, or **PIMENTA,** is the dried berry of a West Indian tree (*Amomis pimenta*) which grows to the height of 20 feet and upward and has somewhat oval leaves about four inches long, of a deep shining green color, and numerous branches of white flowers, each with four small petals. In the whole vegetable creation there is scarcely any tree more beautiful or more fragrant than a young pimenta-tree about the month of July. Branched on all sides, richly clad with deep green leaves, which are relieved by an exuberance of white and richly aromatic flowers, it attracts the notice of all who approach it. About the month of September, and not long after the blossoms have fallen, the berries are in a fit state to be gathered. At this time, though not quite ripe, they are full grown and about the size of peppercorns. They are gathered by hand. The berries are spread in the sun to be dried, an operation that requires great care, from the necessity of keeping them entirely free from moisture. By the drying they lose their green color and become a reddish brown; the process is known to be complete by their change of color and by the rattling of the seeds within the berries. They are then packed into bags or hogsheads for the market. When the berries are quite ripe they are of a dark purple color and filled with a sweet pulp. Pimenta is thought to resemble in flavor a mixture of cinnamon, nutmegs and cloves, whence it has obtained the name allspice. For its use in medicine see CONDIMENTS.

ALLSTON, Washington, American painter and author: b. Waccamaw, S. C., 5 Nov. 1779; d. Cambridge, Mass., 9 July 1843. In early boyhood he moved to Newport, where he attended school. He was graduated from Harvard in 1800, and in the following year went abroad, where he became a student of the Royal Academy. Three years later he went to Rome and there studied the works of the old masters. He passed four years at Rome, the companion of Thorwaldsen, Coleridge, Vanderlyn and Washington Irving, and acquired the lofty tone of the old school, gaining a reputation as a colorist. Returning to the United States in 1809, he married a sister of Dr. William Ellery Channing. From 1811 to 1818 he resided in England and during these years produced some of his best pictures. Of these 'The Dead Man Revived' gained a prize of 200 guineas from the British Institute; and his 'Uriel in the Sun' and 'Jacob's Feast' were also produced about this time. Failing in health, he returned to Boston in 1818 and finally moved to Cambridge, where he lived in comparative seclusion until his death. He was a man of fine sensibility, scholarly tastes, an excellent conversationalist and a writer of distinct charm. His best known works in America are: 'Jeremiah,' 'The Witch of Endor,' 'Miriam,' 'Rosalie,' 'Madonna,' 'Spanish Girl,' 'Belshazzar's Feast.' His best known portraits are those of Benjamin West (Boston Atheneum), Coleridge (National Portrait Gallery, London) and one of himself. His works show a high imaginative power and because of his ability as a colorist he earned the title 'The American Titian.' But he is not so highly esteemed now as he was by his contemporaries. His conceptions, though grand, are not always treated with artistic justice. His literary achievements are 'The Sylphs of the Seasons,' a poem delivered before the Phi Beta Kappa society in 1809 at Cambridge and subsequently published in London (1813); a novel, 'Monaldi,' a romance of Italian life (1841); 'The Paint King' and 'The Two Painters' (London); and a volume of 'Lectures on Art and Poems' (1850). Consult Ware, 'Lectures on the Works and Genius of Washington Allston' (Boston 1852); and Sweester, 'Artist Biographies' (Boston 1879); also Flagg, J. B., 'Life and Letters of Washington Allston' (New York 1892).

ALLUVIAL CONES AND FANS, deposits of sand, gravel and clay built up by streams at points where the gradient decreases and the carrying power of the water is lessened. Everywhere that rivers emerge from mountains onto plains, such deposits are common. If built of coarse material they have steep slopes and are called cones; if of finer material the slopes are gentle and the deposits are known as fans. The latter are often many miles in extent. Where numerous fans coalesce into one fringing deposit at the foot of a mountain range, it is termed a piedmont alluvial plain or a mountain apron.

ALLUVIAL TERRACES. See TERRACES.

ALLUVION, the legal designation of land gained from the water by gradual changes in the shore line. In English law the form of the word generally used is alluvion, and in Scotch law alluvio. In both of these the enactment is, that if an "eyott," or little island, arise in a river midway between the two banks, it belongs in common to the proprietors on the opposite banks; but if it arise nearer one side it then belongs to the proprietor whose lands it there adjoins. If a sudden inundation cut off part of a proprietor's land, or transfer the materials to that of another, he shall be recompensed by obtaining what the river has deposited in another place; but if the process be a gradual one there is no redress. In the United States the proprietor of the bank increased by alluvion may lawfully claim the addition, this being regarded as the equivalent for the loss he may sustain from the encroachment of the water upon his land. Sea-weed which is thrown upon a beach, as partaking of the nature of alluvion, belongs to the owner of the beach. 2 Johns. N. Y. 322. But sea-weed below low-water mark on the bed of a navigable river belongs to the public. 9 Conn. 38. (See ACCRETION; AVULSION). Consult Angell, 'Treatise on the Law of Watercourses' (Boston 1877); and Gould, 'Treatise on the Law of Waters' (Chicago 1900).

ALLUVIUM, a word formerly applied to the gravel, mud, sand, etc., deposited by water subsequently to the Noachian deluge. It was opposed to diluvium, supposed to be laid down

by the deluge itself, or, in the opinion of others, by some great wave or series of waves originated by the sudden upheaval of large tracts of land or some other potent causes, different from the comparatively tranquil action of water which goes on day by day. Now alluvium is especially employed to designate the transported matter laid down by fresh water during the Pleistocene and Recent periods. Thus it indicates partly a process of mechanical operation and partly a date or period. It should not be forgotten that the former has gone on through all bygone geological ages and has not been confined to any one time. Many of the hardest and most compact rocks were once loosely cohering débris laid down by water. The most typical example of alluvium may be seen in the deltas of the Nile, Ganges, Mississippi and many other rivers. Some rivers have alluviums of different ages on the slopes down into their valleys. The more modern of these belong to the Recent period, as do the organic or other remains which they contain, while the older (as those of the Somme, Thames, Ouse, etc.), which are of Pleistocene age, enclose more or less rudely chipped flint implements, with the remains of mammals either locally or everywhere extinct. Though in many cases it is possible clearly to separate alluviums of different ages, yet the tendency of each new one is to tear up, redistribute and confound all its predecessors. Volcanic alluvium is sand, ashes, etc., which, after being emitted from a volcano, come under the action of water and are by it redeposited, as was the case with the materials which entered and filled the interior of houses at Pompeii. Marine alluvium is alluvium produced by inundations of the sea, such as those which have from time to time overflowed the eastern coast of India. See DELTA; RIVER; SOIL.

ALLWARD, Walter Seymour, Canadian sculptor: b. Toronto, Ont., 18 Nov. 1875. He was educated at Dufferin School, Toronto, served five years in an architect's office, at 19 turned his attention to sculpture, in the way of producing figure-work for architectural purposes. This he continued for only a short time, when he received his first commission for the figure of Peace for the Northwest Rebellion monument in Queen's Park, Toronto. Following this he executed busts of Lord Tennyson, Sir Charles Tupper, Sir Wilfrid Laurier and other prominent persons, mostly for the art gallery of the Toronto Provincial Museum. Important works from his hand are the statue of General Simcoe and that of Sir Oliver Mowat, both in Queen's Park, Toronto; the Nicholas Flood Davin monument in Ottawa, and the South African monument, the latter being among the finest in British America. Recent works are the J. Sandfield MacDonald statue in Toronto, 1908; the Baldwin and Lafontaine memorial on Parliament Hill, Ottawa, and the Alexander Graham Bell memorial at Brantford, Ont.

ALLYL, in chemistry, the radical CH_2:CH. CH_2, or C_3H_5. (The isomeric radical CH_3.CH: CH is called propenyl). Allyl forms many compounds, of which the most important is perhaps allyl alcohol, C_3H_5.OH, which is produced when glycerine is distilled with oxalic acid.

ALMA, Mich., city in Gratiot County, 38 miles west of Saginaw, on Pine River, and Ann Arbor and Père Marquette railways; founded 1854; incorporated 1872, and received its city charter in 1905. It manufactures flour, lumber, beet sugar, auto trucks, hay and paper presses, gas engines, furnaces, cement blocks and asphalt mastic; has water works and electric lighting. It contains Alma College (q.v.), Alma Sanitarium, widely reputed, and the Michigan Masonic Home. It has one-year mayoralty and a council of eight. Pop. (1910) 2,757; (1916) 3,000.

ALMA, a river in the Crimea, rising at the foot of the Tchadir Dagh and flowing west into the Bay of Kalamita, about half way between Eupatoria and Sebastopol. It is about 46 miles long and is renowned for the scenic beauty of its banks. On the steep banks of the stream, through the channel of which the British troops waded amid a shower of bullets, a brilliant vistory was won 20 Sept. 1854, by the allied armies of England, France and Turkey, led by Lord Raglan and Marshal St. Arnaud, over the Russian army commanded by Prince Menschikoff. After a stubborn contest lasting five hours the Russians retreated in disorder, leaving 17 per cent of their 33,000 effectives on the field. The allies numbered about 62,000. It was the first battle of the Crimean war.

ALMA COLLEGE, co-educational institution founded at Alma, Mich., in 1887. It is under the control of the Presbyterian Church, maintains a college department, an academy, and schools of music and art, and extension courses. The degrees conferred are those of A.B., Ph.B. and B.Sc. In 1917 the institution had a faculty of 21 members and a student enrolment of 213. The library contained 26,437 volumes; the endowment amounts to about $400,000, and the campus of 36 acres, together with the buildings, are valued at $190,000.

ALMA MATER, a term familiarly applied by those who have attended a university to the particular university they have attended. The adjective *almus* in Latin means cherishing, fostering, dear.

ALMACK'S, äl'măks, the name formerly given to certain assembly-rooms in King Street, St. James's, London, derived from Almack, a tavern-keeper, by whom they were built, and whose real name is said to have been M'Call, and transformed into Almack by reversing the syllables. The premises are now known as "Willis's Rooms." First opened 20 Feb. 1765, they soon became famous for the extreme exclusiveness displayed by the lady patronesses in regard to the admission of applicants for tickets. These fair arbiters composed a board of six, which held its sittings every Monday evening during the London season, and issued those fiats which were supposed to affect so conclusively the claims of the received or rejected applicant, as the case might be, to occupy the upper circles in the fashionable world. To have danced at Almack's became almost proverbial as indicative of exalted social position. The name was also given to a gambling club established by the same Almack in 1763, to which such men as Charles James Fox, William Pitt and Gibbon belonged. It is now known as Brooks's club. Consult Timbs, 'Clubs and Club Life in London' (London

1873), and Walford, 'Greater London' (ib., 1884).

ALMADA, ąl-mä'dą, Portugal, a town in the province of Estremadura on the left bank of the estuary of the Tagus, opposite Lisbon. It is built upon a height, in a well-cultivated country, and has long been celebrated for its figs and the neighboring gold mine of Adissa. It has a strong castle on a rock, several depots for wine and a mineral spring. Pop. 8,000.

ALMADEN, ąl'mä-dăn, Cal., town in Santa Clara County, noted for its mines of mercury and its mineral springs. It was named after the Spanish town mentioned below on account of its four quicksilver mines, the New Almaden, Providence, Enriquita and Guadelupe. Large quantities of mercury have been distilled from the ore (cinnabar), and the existence of this deposit has been of immense benefit to the Pacific States. Pop. 3,000.

ALMADEN, or ALMADEN DEL AZOGUE, -dĕl ą-thō'gă (mine of quicksilver), a town in Spain 50 miles southwest of the town of Ciudad-Real in the province of the same name. It is widely known for its rich quicksilver mines, which have been worked for centuries, and in which some 4,000 miners are employed. Since 1645 the mines have been the property of the Crown. The town contains a ruined castle of the Moorish period and a school of mines. Pop. 3,500.

ALMAGEST, ăl'mą-jĕst. The usual appellation of the 'Syntaxis' of Ptolemy, derived from an Arabic term signifying "the greatest." This celebrated work was written about the middle of the 2d century of our era and comprises an exposition of the ancient system of astronomy so elaborate and thorough as to have made it a standard for 13 centuries. It contains the most ancient known catalogue of the stars, with observations of the motion of the planets and determinations of their periods. Several editions, one in Greek and others in Latin, appeared in Europe between 1500 and 1700. The most recent accessible edition is that of the Abbe Halma, which is in Greek and French (2 vols., Paris 1814–15).

ALMAGRO, ăl-mä'grō, **Diego,** one of the companions of Pizarro in the conquest of Peru, was a foundling, and the exact date of his birth is not known; d. 1538. He engaged with Pizarro and Fernando de Lugue in the long and arduous expedition in which they made the discovery of Peru (1524–27), took part in the conquest of the country and the treacherous murder of Atahualpa (1533), and after frequent disputes with Pizarro about their respective shares in their conquests he led an expedition against Chile, of which he was appointed governor. Having failed to conquer his new province he returned to find Cuzco in possession of the Indians, who had expelled Pizarro. He reconquered it and made himself governor, but, Pizarro returning, a struggle took place between the two parties in which Almagro was finally overcome, taken prisoner, strangled and afterward beheaded. He was avenged by his son, who raised an insurrection in which Pizarro was assassinated in 1541. The younger Almagro was put to death in 1542 by De Castro, the new viceroy of Peru. Almagro showed himself, like most of the Spaniards engaged in the conquest of the New World, capable of enduring great privations with heroic constancy, and of effecting wonderful achievements by undaunted valor, but cruel, rapacious and unscrupulous in success.

ALMAGRO, Spain, town in the province of Ciudad-Real, 12 miles from the city of Ciudad-Real, in the midst of an elevated plain. Its streets are wide and well paved and there is a large open public square. Lace is made here to a considerable extent, as well as soap, brandy and coarse pottery. It is best known as the centre of the Valdepeñas red wine district. Pop. 8,300.

ALMALEE, ăl-ma'lē, Asiatic Turkey, town on the river Myra, 25 miles from its mouth and 50 miles west southwest of Adalia. It is beautifully situated in a kind of natural amphitheatre enclosed by lofty mountains. It has thriving manufactures and a considerable trade. Pop. 12,000.

AL-MAMUN, mä-mön', a caliph of the Abasside dynasty, son of Harun al-Rashid: b. 786; d. 833. Under him Bagdad became a great centre of art and science.

ALMANAC, a table or calendar, in which are set down the revolutions of the seasons, the rising and setting of the sun, the phases of the moon, the most remarkable conjunctions, positions and phenomena of the heavenly bodies, for every month and day of the year; also the several fasts and feasts to be observed in the Church and state, etc. The history of the almanac, and even the etymology of the word, are involved in considerable obscurity. It is generally derived from the Arabic article *al* and the verb *manach,* to count. The modern almanac answers to the *fasti* of the ancient Romans. Almanacs became generally used in Europe within a short time after the invention of printing; and they were very early remarkable, as some are now in England, for the mixture of truth and falsehood which they contained. In 1579 their effects in France were found so mischievous, from the pretended prophecies which they published, that an edict was promulgated by Henry III forbidding any predictions to be inserted in them relating to civil affairs, whether those of the state or of private persons. No such law was ever enacted in England. It is singular that the earliest English almanacs were printed in Holland on small folio sheets; and these have occasionally been preserved from having been pasted within the covers of old books. In the reign of James I letters patent were granted to the two universities and the Stationers' Company for an exclusive right of printing almanacs. These, in 1775, were declared to be illegal. During the civil wars of Charles I and thence onward, English almanacs were conspicuous for the unblushing boldness of their astrological predictions and their determined perpetuation of popular errors. The Stationers' Company, who had managed to retain a monopoly notwithstanding the invalidity of the letters patent in their favor, were guided merely by commercial principles in supplying the market, and accordingly adapted their almanacs to the taste of the public, which, on one occasion, when the trial was actually made, refused to purchase them without the predictions. Gradually, however, a better taste began to prevail, and in 1828 the Society for

the Diffusion of Useful Knowledge had the merit of taking the lead in the production of an unexceptionable almanac in Great Britain. The example thus set has been almost universally adopted. Almanacs, from their periodical character and the frequency with which they are referred to, are now more and more used as vehicles for conveying statistical information. Regiomontanus was the first person in Europe who prepared almanacs in their present form, without the predictions, which were in all probability introduced into Europe from the Persians. Once they were almost entirely filled with subjects of a religious character. At another time they overflowed with astrological calculations and predictions. In the time of Napoleon an almanac was published in France in which, to every day, an achievement of the Emperor, or something else relating to him, was added. Almanacs in the petty principalities of Germany exhibit the endless genealogical tables of the princes. Some almanacs in modern Greek, printed at Venice, where formerly all books in this language were published, are quite full of astrological superstition and matters relating to the Greek Church. A modern Persian almanac contains a list of fortunate days for certain purposes; as, for example, to buy, to sell, to take medicine, to marry, etc.; and predictions of events, as earthquakes, storms, political affairs, etc. One of the most curious almanacs is an Italian one exhibiting Italian vivacity in a striking manner. To the entry 30 July is added, *Sudano ancora le ossa!* (Even the bones sweat); to 11 August, *Oh! che noia!* (Oh! how distressing !); to 12 July *Cascano le braccia* (The arms fall); to 2 January, *Stivali e ombrello!* (Leggings and umbrellas!) In Germany, *almanach* is the name given to annuals like those which used to appear in England and the United States under the names of 'Souvenir,' 'Forget-me-not,' etc. In France a work once appeared annually entitled 'Almanach des Gourmands,' which was conducted with much spirit and is in high repute among epicures. Some of the almanacs that are regularly published every year are extremely useful and are indeed almost indispensable to men engaged in official, mercantile, literary or professional business. Such in Great Britain are 'Oliver & Boyd's Edinburgh Almanac,' 'Thom's Official Directory' and the 'British Almanac,' with its 'Companion.' 'Whitaker's Almanac' is also known as a very comprehensive and valuable compendium. The 'Almanach de Gotha,' which has appeared at Gotha since 1764, contains in small bulk a wonderful quantity of information regarding the reigning families and governments, the finances, commerce, population, etc., of the different states throughout the world. It is published both in a French and in a German edition. 'The Nautical Almanac' is an important work published annually by the British government, two or three years in advance, in which is contained much useful astronomical matter, more especially the distances of the moon from the sun, and from certain fixed stars, for every three hours of mean time, adapted to the meridian of the Royal Observatory, Greenwich. By comparing these with the distances carefully observed at sea the mariner may with comparative ease infer his longitude with sufficient accuracy in case he has no chronometer for keeping Greenwich time. This almanac was commenced in 1767 by Dr. Maskelyne, astronomer royal. The French 'Connaissance des Temps' is published with the same views as the English 'Nautical Almanac' and nearly on the same plan. It commenced in 1679. Of a similar character is the 'Astronomisches Jahrbuch,' published at Berlin. The 'American Ephemeris and Nautical Almanac' is issued annually since 1855 by the United States government.

The first American almanac was that of William Pierce of Cambridge, published in 1639. The most famous of American almanacs was 'Poor Richard's,' published in Philadelphia by Benjamin Franklin under the pseudonym of "Richard Saunders." This almanac was probably imitated from that of Thomas, of Dedham, Mass., which was kept for a good many years and contains many pleasant and witty verses, jests and sayings. The information printed in these almanacs seems to have been the only means of carrying news to the more distant parts of the country. 'The American Almanac' appeared between 1830–61, and a second publication under the same name was edited for several years by Ainsworth R. Spofford. Several of the largest newspapers in the United States now issue almanacs which are marvels of condensed information. See CALENDAR.

ALMANDITE, or **ALMANDINE,** a variety of the garnet (q.v.).

ALMANSA, ăl-măn'są, Spain, a manufacturing and farming town of southeastern Spain (Murcia), near which was fought (25 April 1707) a decisive battle in the War of the Spanish Succession, when the French, under the Duke of Berwick, defeated the Anglo-Spanish army under the Earl of Galway. Pop. 12,000.

ALMANZUR, ăl'măn-soor, or **ALMANSUR,** a caliph of the Abasside dynasty, reigning 754–75. He was cruel and treacherous and a persecutor of the Christians, but a patron of learning.

ALMA-TADEMA, ăl'ma tăd'ē-ma, **Sir Lawrence,** O.M., R.A., Anglo-Dutch painter: b. West Friesland, Holland, 8 Jan. 1836; d. Wiesbaden, Germany, 25 June 1912. He was educated at the Antwerp Academy of Fine Arts under Wappers and Baron Leys and obtained a medal at the Paris Salon of 1864 and another at the Paris Exposition of 1867. He went to England to live in 1870, exhibiting at the Royal Academy that same year 'Un Amateur Romain' and 'Un Jonglier,' which attracted immediate attention. Becoming a naturalized Englishman, he adopted the double name Alma-Tadema (having been christened Laurenz Alma). He became an associate of the Royal Academy in 1876, and R.A. in 1879; was knighted in 1898 and raised to the Order of Merit in 1905. His especial field was the portrayal of Greek and Roman life, and all his work is marked by the most careful attention to archæological details. His execution is scholarly, his coloring accurate and his artistic feeling rarely at fault, but while his canvasses attract the eye and delight the intellect they seldom touch the heart. Among his more noted pictures (he painted about 500), may be mentioned—'Clotilda at the Tomb of Her Grandchildren' (1858); 'The Education of the Chil-

dren of Clovis' (1861); 'The Roses of Heliogabalus' (1888); 'A Reading from Homer'; 'The Four Seasons'; 'The Vintage Festival'; 'Caracalla and Geta.' Sir Lawrence was twice married, and left two daughters, one a writer, the other a successful artist.

ALMA-TADEMA, (Miss) **Laurence,** English novelist: b. in England. She is the second daughter of the late Sir L. Alma-Tadema (q.v.) and has published: 'Love's Martyr'; 'The Wings of Icarus'; 'The Crucifix'; 'Realms of Unknown Kings'; 'The Fate Spinner' (1900); 'The Unseen Helmsman' (1901); 'Songs of Womanhood' (1903); 'Four Plays' (1905); 'Tales from My Garden' (1906).

ALMAZOV, Boris Nikolayevich, bō-rēs' äl-ma-zof, Russian poet and humorist: b. Vyazma 1827; d. Moscow, 3 April 1876. He was educated in the first gymnasium of Moscow and in a private boarding-school. In 1848 he entered the law-school of the University of Moscow but left it without graduating. He began his literary activities in 1851. In that year appeared in *Moskvityanin* his clever criticism of current journalism under the pseudonym of "Erast Blagonravov." When *Moskvityanin* was discontinued he began contributing original poems and translations to '*Biblioteka dlya chteniya,*' '*Russki Vyiestnik*' and '*Utro.*' His poems are written in a smooth and easy style and are characterized by beauty of expression and rhythm. They are, however, devoid of content and, therefore, brought the author no glory. He became, however, well known in the sixties through his humoristic poems and clever parodies published in satirical journals, particularly in *Razvlecheniye.* His satire is not very biting but his criticism is striking. The more serious works of Almazov are his 'Critical Articles about Pushkin' (*Utro* 1858); the translation, 'Lay of Roland' (*Moskvityanin* 1869); the novel, 'Katenka' (*Moskvityanin* 1875); 'Poems' (1879); 'Works' (3 vols., 1892), with his portrait and biography. His better known comical poems are 'Funeral of the Russian Language' and 'Scientific and Literary Masquerade.' Their humor, however, lacks seriousness. He sometimes used the pseudonym 'Adamantov.'

ALMEIDA, al'mā-idą, Portugal, town in the province of Beira, on the Spanish frontier, and on the river Coa. It was at one time one of the chief strongholds of Portugal. In 1762 it was taken by the Spaniards, who later surrendered it. A great part of the fortifications were destroyed by the French under Brenier in their retreat from Portugal in 1811. The fortifications were soon restored by the English. Almeida is famous also for its sulphur waters. Pop. about 2,500.

ALMENDRALEJO, al'mĕn-drä'yā-hō, Spain, town of Badajoz province, 28 miles by rail southeast of Badajoz. Since 1875 and the introduction of the railroad and improved facilities of transport, the trade in locally manufactured brandy and wines, and in the grain and fruit of the surrounding districts, has attained great importance. The town is well built; its most notable edifice is the palace of the marquesses of Monsálud, and their museum of locally discovered Roman antiquities. Pop. 12,500.

ALMERIA, äl'mā-rē'ą, Spain, seaport city, capital of Almeria province, on the Mediterranean, 104 miles east of Malaga. At the mouth of a river at the head of a gulf, both bearing the same name, Almeria has one of the best harbors in Spain, and is the terminus of a railroad from Madrid. A large export trade is carried on in white grapes, fruit, esparto grass, iron and lead; coal and lumber are the chief imports; and macaroni, sugar and white lead are manufactured. Of antiquarian interest is the old Moorish castle rising above the city, and the fortress-like cathedral dating from 1524. Almeria was an ancient Phœnician settlement, the Roman Unci and Magnus Portus, a prosperous Moorish seaport, and also a notorious nest of pirates. Railroad, pier and docking facilities have created its modern importance. Area of province, 3,360 square miles; pop. 359,000. Pop. of city, 47,500.

ALMODOVAR DEL CAMPO, äl'mō-dō'-vär dĕl käm'pō, Spain, town of Ciudad-Real province, 20 miles by rail southwest of Ciudad-Real. A fortified Moorish town of the Middle Ages. It derives its modern importance from the neighboring Puertollano coal mines, and the sheep-grazing crown lands of the Sierra de Alcudia, which rise above the town. Pop. 14,000.

ALMOHADES, ăl'mō-hădz, from the Arabic "Al-Muwahhadis"— the Unitarians — the Spanish name given to the 12th century Moorish dynasty which ruled northwestern Africa and Spain. Their origin is traced to Abu Abdillah Mohammed ben Tumart, a deformed youth of humble parentage, a Masmuda Berber from the Atlas, who, as a traveling devotee beggar, obtained instructions in Cordova, Cairo, Bagdad, and made the pilgrimage to Mecca. On his return to Morocco he became known by the boldness of his preaching and by the austerity of his life. In Abd-el-Mumim el Kumi, another Berber, he found a disciple, whose mind he filled with a belief that he was reserved to inaugurate a purified Mohammedan creed. Preaching the coming of the great Mahdi (director) who was to establish the reign of universal justice and peace, Abd-el-Mumin one day remarked "You yourself are the great Mahdi," swore allegiance to him with 50 other listeners, and was followed soon after by 70 others. Preaching the unity of God, they retired to the mountains. Their number soon increased to 20,000 and a victory over the King's brother established the power of the Almohades. By 1147 they had conquered Morocco. In the meantime Abu Abdillah had died and been succeeded by Abd-el-Mumin. He and his successors Yusuf, Yacub-ibn-Yusuf, Mohammed Abu-Abdallah, overthrowing the Almoravidian Moorish dynasty established themselves in Portugal and Spain, until 12 June 1212, they were defeated by the Christians in the battle of Navas de Tolosa, leaving it is said 170,000 dead on the field. Soon after, disorganized by internal dissensions, the power of the Almohades in Spain had disappeared by 1257 and in Africa by 1269.

ALMOND, äl'mŭnd, the tree and nut of *Amygdalus communis* of the family *Amygdalaceæ,* supposedly a native of the Mediterranean region and of southwestern Asia, but so long in cultivation that its origin is a

matter of conjecture. In habit of growth the tree, which reaches a height of 20 or 30 feet, is like the peach, with which some botanists have mistakenly surmised that it was formerly identical. The hard, inedible pulp of its fruit (a drupe) splits at maturity and exposes the pit or "almond" of commerce. Varieties of almonds are classed as bitter or sweet. The former, little grown outside the Mediterranean region, furnish prussic acid and oil of bitter almonds used in perfumery and culinary preparations; the latter, grown extensively in California and southern Europe and in similar climates, furnish one of the most agreeable of nut fruits. The sweet almonds are divided into hard- and soft-shelled varieties, the former little grown, the latter extensively. Some specially thin-shelled sorts are known as paper-shells. The kernels, particularly of sweet almonds, are rich in a mild fixed oil which is expressed for medicinal and other purposes, but the nuts are chiefly used for dessert, either directly or in some prepared form, such as confectionery.

The almond succeeds best upon light, thoroughly drained soil so situated that early frosts, which destroy the fertility of the blossoms, need not be feared. The trees, which are generally propagated by budding the desired varieties upon bitter almond seedlings, are set about 25 feet apart, different varieties that blossom simultaneously being planted in each other's proximity to ensure cross-pollination, self-sterility being characteristic of many varieties. If trees are properly trained during their first three or four years they demand little severe pruning afterward. Cultivation does not differ materially from that of other tree-fruits. In California the nuts are harvested from August to October, dried for several days, and if discolored, as is often the case where the air is very humid, they are lightly sprayed with water and then treated with sulphur fumes to bleach the shells somewhat. Nuts that are too badly discolored to respond to this treatment are cracked by machinery and the kernels sold largely to confectioners. Because frost and self-sterility have been often overlooked, almond-growing in California has been remarkable for failures; many orchards have been cut down for firewood. But when and where conditions are favorable the crop is a profitable one. In 1897, 218 carloads were shipped from California; in 1912 the production was 3,000 tons. Attention has been drawn to parts of Arizona and New Mexico as probably adapted to the almond, and some orchards have been planted. About $1,000,000 worth of almonds are imported annually. The almond is sometimes attacked by a fungus which appears first as a yellow rust on the leaves. This often leaves the tree bare of foliage as early as 15 July. Spraying is the only remedy. See FUNGICIDES.

As an ornamental tree the almond, like the peach, is often planted even in localities unfavorable to fruit-production. But its relative, the dwarf almond (*Amygdalus nana*), a native of southern Russia, is hardy and is recommended as an ornamental shrub by nurserymen for northern climates.

ALMONRY SCHOOLS, institutions for boys which began to be attached to monasteries in the 14th century. The almoner was the dispenser of charity generally, but there is no record of education in connection with the office until 1880 when the archdeacon of Durham gave a manor to the almoner of Cathedral Monastery to supply food and lodging for three boys from the grammar school. At the beginning of the 14th century a movement for the training of choristers in connection with the more elaborate worship of the Virgin Mary grew up and special provision was made at the monastery for their housing and education. The boys were kept as charity students. They acted as page boys and choristers and were taught and managed by secular clerks as masters. At Canterbury in 1320 a body of choristers was first inaugurated by royal grant to pray for the soul of Edward I. Saint Albans Abbey founded in 1339 an "Order of living for the poor scholars in almonry," making the term of education five years. Westminster opened its school with two boys in 1355, which continued under a special master in 1540. The school was revived when the abbey became a cathedral in 1540, with 40 boys. Durham, Saint Mary's, Coventry and other abbeys also kept such schools. Altogether about 2,000 boys were thus provided with free board and education in England. Saint Paul's is the only secular church in which an almonry school exists, which began in the 14th century. Many of the pupils passed on to colleges and universities.

ALMONTE, ăl-mŏn'tā, Canada, situated in Lanark County, Ont., on the Mississippi River 30 miles west of Ottawa and on the Canadian Pacific Railway. Its industries include woolens, tweeds and hosiery, stoves and agricultural implements, etc. Pop. (1911) 2,452.

ALMORAVIDES, ăl-mŏ'rą-vĭdz, from the Arabic "al-Murabathin — the devoted," whence "Marabouts — the hermits," an 11th century Moslem dynasty of northwest Africa and Spain. It originated with Abdallah ibn Yasim, who preached Mohammedanism among the Arabian tribes of northern Morocco, and died in battle A.D. 1058. Abubekr ibn Omar succeeded him, but after some minor victories was ousted by his lieutenant Yusuf ibn Tashfyn, who founded the city and empire of Morocco. Yusuf was invited to Spain by the Moorish Prince of Seville to aid him against the Christians and defeated them in a desperate battle on the plains of Zalaca in 1086. Yusuf returned to Morocco, but the following year came back to Spain, defeated the Moorish kings in detail and proclaimed as his successor his son Ali ben Yusuf, who ruled until 1143. Five years later the Almoravian dynasty was overthrown by the Almohades (q.v.).

ALMQVIST, ălm'kvĭst, **Karl Jonas Ludvig,** Swedish poet and author: b. Stockholm 1793; d. Bremen, 26 Sept. 1866. He achieved literary fame in 1832 by a group of romances, the leaders of Swedish literature, entitled 'The Book of the Thorn-Rose.' 'Araminta May,' 'The Mill at Skällnora, and 'Grimstahama's Settlement' are his best tales; notable novels are 'The Palace,' 'It's All Right,' 'The Lords of Ekolsund,' 'Amarina,' 'Gabrielle Mimanso' and 'Amelia Hillner.' His writings are distinguished by brilliancy of style and great dramatic power. His life was of the most un-

stable character. Implicated in a case of forgery and murder by poisoning in 1851, he disappeared for 15 years. It is now known that he came to America and settled in St. Louis, where he earned a scanty living, returning to Bremen in 1866, where he lived until his death, under the assumed name of C. Westermann. Translations of his works are very popular in Germany.

ALNWICK, ăn'ĭk, England, town, capital of Northumberland County, on the Alne, 30 miles by rail north of Newcastle. Its chief feature is the ancient Norman castle on a hill above the river northwest of the town, the residence since 1309 of the Percys, dukes of Northumberland. It covers five acres of ground and was restored in 1830 at an outlay of $1,000,000. It is one of the finest types of old baronial castles in England. Alnwick from earliest times was a border stronghold against Scottish incursions; and here in 1093 Malcolm III of Scotland was slain and his army routed; and in 1174 William the Lion was defeated at the head of a large army and made prisoner. Pop. 7,000.

ALOE, a genus of succulent-leaved plants of the family *Liliaceæ,* natives chiefly of Africa. The numerous species range in height from a few inches to 25 feet or more. Some are valued for their fibre, which is used for cord-, net- and fabric-making; others for the medicinal qualities ascribed to them. Chief among the latter are several arborescent species, *Aloe succotrina, A. spicata, A. purpurascens,* and *A. arborescens,* from which Cape aloes is mainly derived, and *Aloe vera,* a Mediterranean species frequently cultivated in the West Indies, which yields Barbadoes or hepatic aloes. *Aloe perryi* furnishes Zanzibar or Socotrina aloes, also a transparent pigment valued in miniature-painting and a rich violet dye.

ALOES, the inspissated juice of the leaves of a number of species of *Aloë,* a genus of the lily family of over 100 species, widely distributed in warm arid regions. The leaves are long, thick and succulent, and the juice that yields aloes is thin and flows readily from the cut leaf. This is then thickened (inspissated) by natural or by artificial drying and there results a yellow to brownish to blackish, or greenish, mass of a tarry, waxy or glassy consistency. The aloes that is used in the United States is either Barbadoes aloes, from *Aloë vera,* or Socotrina aloes, from *Aloë Perryi.* As a medicine aloes has been used for centuries. It is a powerful cathartic, acting particularly on the large intestine, its active principle being termed *aloin.* Its action is extremely variable, and in large doses it has been known to induce abortion. See CATHARTICS.

ALOES WOOD (sometimes called also eagle wood, calambac, paradise wood or agallochum), the inner part of *Aquilaria malaccensis* and *A. agallochum,* trees of the family *Thymelacaceæ,* natives of the tropical parts of Asia, and supposed to be the aloes or lignaloes of the Bible. They are large, spreading trees. Aloes wood contains a dark-colored, fragrant, resinous substance, and is much prized in the East as a medicine and for the pleasant odor it diffuses in burning.

ALOGI, a sect of heretics in the 2d century. They are said to have been founded by Theodotus of Byzantium, a leather dresser, and were rivals and opponents of the Montanists. Epiphanius declares that they denied that Jesus Christ was the Logos, and thus gave them their name. They also denied the continuance of the gifts of the Holy Spirit. They rejected the Gospel of John and the Apocalypse which they ascribed to Cerinthus the Gnostic. Further they rejected the Millenarianism and prophetism of the Montanists.

ALOIDÆ, or ALOADÆ, in Greek legend, the giant twin sons of Neptune and the wife of Aloeus. They were named Otus and Ephialtes and at the age of nine measured 27 cubits in height and nine cubits in breadth. They chained the god Mars in a bronze cask and kept him there 13 months. By piling Pelion upon Ossa they sought to reach heaven and war on the Olympian gods and would have succeeded before their beards had grown, but were destroyed by Apollo.

ALOPECIA, a partial or complete loss of hair in large quantities. This is due to a number of causes and frequently leads to baldness (q.v.). Alopecia is of two main kinds: primary or secondary. In primary alopecia there may be (1) a congenital lack of hair (this is rare); (2) senile alopecia, due to the advent of old age; (3) premature baldness, this may be a natural product, or it may be the result of a chronic seborrhea, or dandruff (q.v.).

ALORA, ä'lō-ra, Spain, town and health resort, Malaga province, on the river Guadalhorce, 18 miles by rail northwest of Malaga. It is frequented for its medicinal sulphurous springs, and has manufactures of spirituous liquors and a considerable trade in the fertile valley products, corn, sugar-cane, dates, etc. Pop. 11,000.

ALOST, ä'lōst, Flemish *Aalst,* älst, Belgium, an old historic town of East Flanders, on the river Dendre, about half-way between Brussels and Ghent. It was formerly the capital of the county of Aalst, which passed in 1056 into the possession of the counts of Flanders under the name of Keizer-Vlaanderen. The Dendre divides the town into two unequal parts. Pop. (1912) 35,130. Over a thousand years ago Alost became a walled town; a grandson of William the Conqueror was killed under its walls in 1128. The main object of attraction is the fine old Gothic church of Saint Martin's which was commenced toward the end of the 15th century and was intended to be a copy of the cathedral at Amiens. The scheme was apparently too ambitious for the available resources, for not only in the tower missing, but the nave was built only half its proposed length. The edifice contains a remarkable painting by Rubens, "Saint Roch interceding for the Plague-stricken," which is said to have been painted in eight days to the order of the town about 1625–30. The first printing press in Belgium was set up in Alost, the birthplace of Thierry Maertens, one of the claimants to the honor of inventing the art of printing. Maertens appears to have worked under Gutenburg at Mayence, and returned to Alost in 1475. Until recent years the people of Alost used to keep up the ancient practice of sword-dancing, almost identical with that

in vogue in Scotland. Tradition ascribes the dance to have come down from the Nervii; increased industrial activity in Alost led to its falling into disuse. Due to the great trade in hops and various manufacturing industries, no town in Belgium had made greater progress during the past 30 years than Alost.

The European War brought dire tragedy upon the town. On 11 Sept. 1914 an engagement was fought there between the German invaders and Belgian troops. Civilians were taken prisoners; their money was confiscated; a number were shot or bayoneted, and others were driven in front of the German troops as a screen against the Belgian army. The Belgian left advanced from Termonde and Lierre and recaptured Alost 26 Sept. 1914. "During their retreat the Germans fired 12 houses . . . and three civilians were shot dead in the street . . . a heap of nine dead civilians were lying in the Rue de l'Argent" (Bryce Report). The Germans bombarded and captured Alost again on 29–30 September, and wreaked terrible vengeance on the unfortunate citizens for the repulse they had suffered at the hands of Belgian soldiers. See BRYCE COMMITTEE, REPORT OF.

ALOYSIUS GONZAGA, Saint: b. Lombardy 1568. At the age of 17 he transferred his inheritance and right of succession to his brother Rudolph and immediately set out for Rome. Here he entered the novitiate of the Society of Jesus, and shortly after began his studies in the Roman College. While nursing the victims of a contagion then ravaging the city he contracted the disease and died in his 25th year. His brief career was characterized by such extraordinary virtue that he was canonized a saint by Pope Benedict XIII in 1726, and is now recognized by the Catholic Church as the Patron of Young Students. His feast day in celebrated 21 June.

ALP-ARSLAN, älp'är-slän ("strong lion"), the greatest ruler of the Seljuk Turks: b. Turkestan 1028; d. Berzern 1072. He succeeded his uncle Togrul 1063, consolidated his realm into one kingdom and then proceeded to a career of conquest interrupted only by his death. He conquered central Asia to the Oxus; and invading Armenia and Georgia, in August 1071, he overthrew and captured the Emperor Romanus IV (Diogenes) in a bloody battle near Malaskerd, between Van and Erzerum, and only released him on payment of a vast ransom. He was assassinated while invading Turkestan and was buried at Merv.

ALPACA, or **PACO** (Ar. *al,* the; Peruv. *paca*), a semi-domesticated animal (*Lama pacos*), native to the Andes and valued for its wool. It is a cameloid mammal, closely allied to three others of the same region, the vicuña, the llama and the guanaco; but it much resembles a sheep, except in the length and erect carriage of its head. The natural growth of its thick woolly hair would be about two feet, but it is clipped, the annual growth being about eight inches. In color the wool varies from pale yellowish brown or gray to black; its fibre is straighter than that of sheep wool, and very fine, glossy and elastic. The animal is now seldom seen in an entirely wild state. See LLAMA.

ALPENA, Mich., city and the county-seat of Alpena County, 110 miles north of Bay City; on the west side of Lake Huron, at the head of Thunder Bay, on the Detroit and Mackinaw Railway. It is divided in two by Thunder Bay River, from which water power is procured from three dams, facilitating extensive manufactures of paper from wood-pulp and of cement from limestone and clay. Further establishments include large tanneries, large extract works (hemlock) for export trade, foundries and machine shops, saw-mills, shingle-mills, veneer-mills a woolen-mill, flour-mills, large sash and blind factories, large excelsior-mills, quarries, stave and heading factories, municipal electric lighting and water plants and a government fish hatchery. The United States census of 1914 recorded 54 manufacturing establishments of factory grade, employing 1,636 persons, of whom 1,494 are wage earners, receiving a total of $895,000. The capital engaged aggregated $4,712,000, and the output was valued at $4,102,000; of this, $1,804,000 was added by manufacture. The harbor facilities are excellent. Alpena is governed on the commission-manager plan, under the recent enabling act of the State Legislature. Alpena was settled in 1835 and incorporated 1871. Pop. 15,000.

ALPES-MARITIMES, ąlp mă'rē'tēm', France, southeastern department on the Mediterranean and Italian border, noted for its picturesque scenery and fine climate. The celebrated health resorts, Nice (the capital), Grasse, Cannes and Mentone are in this department. Area, 1,482 square miles; pop. 356,500.

ALPHA and OMEGA, the first and last letters of the Greek alphabet, used widely in ecclesiastical literature as a term signifying "completeness." Jesus Christ is designated the "Alpha and Omega," three times in Revelations i, 8; xxi, 6; xxii, 13. ALEPH and TAU, the first and last letters of the Hebrew alphabet, are similarly used and Isaiah xliv, 6 represents God saying "I am the first and I am the last," as an expression of eternal and universal omnipotence.

ALPHABET (from *alpha* and *beta,* the first two letters of the Greek alphabet), the ordinary series of the letters or syllables (in syllabic alphabets) of a language. For an account of what is known or conjectured of the origin of alphabetic and other systems of writing, see WRITING. The English alphabet, like the most of those of modern Europe, is derived directly from the Latin, but owes its ultimate origin to the Phœnician, which gave birth also to the ancient Greek, the Etruscan, the Gothic, etc. According to tradition the Phœnician Cadmus introduced writing into Greece, the letters first used being the same as the Phœnician, but afterward undergoing changes both in sound and form. It would appear that the Phœnicians borrowed their alphabet from the hieratic alphabet of Egypt, whence also the Hebrews may have obtained theirs during their long stay in that country, though it is more probable that like the Aramæans they were content to receive it at second-hand from the Phœnicians. The Egyptian origin of the Phœnician alphabet, however, has not been definitely established, and some hold to the

SOUTH SEMITIC ALPHABETS | ARAMÆAN ALPHABETS | HELLENIC ALPHABETS

Nagari	Alphabet of Asoka. (3d century B. C.)	Modern Amharic	Inscriptions at Safa. (1st century A. D.)	Modern Arabic	Inscriptions at Sinai. (5th century A. D.)	Modern Syriac	Modern Hebrew	Inscriptions at Jerusalem. (1st century B. C.)	Aramaic. (7th century B. C.)	Moabite Stone. (9th century B. C.)	Greek Inscriptions at Thera (9th century B. C.)	Eastern Greek. (c. 460 B. C.)	Babœan Greek.	Latin.	Roman Uncials. (5th–6th centuries A. D.)	Irish Half-Uncials. (7th–8th centuries A. D.)	Caroline Minuscule. (9th century A. D.)	Greek Uncials. (5th–6th centuries A. D.)	Greek Cursive. (7th century A. D.)	Greek Minuscule. (Modern)	Cyrillic.
अ	𐨀	አ	𐩱	ا	ا	ܐ	א	𐤀	𐡀	𐤀	Α	Α	Α	A	A	a	a	Α	α	α	А
ब	𐨁	ብ	𐩲	ب	ب	ܒ	ב	𐤁	𐡁	𐤁	Β	Β	Β	B	B	b	b	Β	β	β	Б
ग	𐨂	ገ	𐩳	ج	ج	ܓ	ג	𐤂	𐡂	𐤂	Γ	Γ	Γ	C	C	c	c	Γ	γ	γ	Г
द	𐨃	ደ	𐩴	د	د	ܕ	ד	𐤃	𐡃	𐤃	Δ	Δ	Δ	D	D	d	d	Δ	δ	δ	Д
ह	𐨄	ሀ	𐩵	ه	ه	ܗ	ה	𐤄	𐡄	𐤄	Ε	Ε	Ε	E	E	e	e	Ε	ε	ε	Е
उ	𐨅	ወ	𐩶	و	و	ܘ	ו	𐤅	𐡅	𐤅	Ϝ	Ϝ	Ϝ	F	F	f	f	Ϝ	ϝ	ϛ	Ѕ
क	𐨆	ዘ	𐩷	ز	ز	ܙ	ז	𐤆	𐡆	𐤆	Ζ	Ζ	Ζ	Z	Z	z	z	Ζ	ζ	ζ	З
ख	𐨇	ሐ	𐩸	ح	ح	ܚ	ח	𐤇	𐡇	𐤇	Η	Η	Η	H	H	h	h	Η	η	η	И
ग	𐨈	ጠ	𐩹	ط	ط	ܛ	ט	𐤈	𐡈	𐤈	[⊕]	Θ	Θ					Θ	θ	θ	
त	𐨉	የ	𐩺	ي	ي	ܝ	י	𐤉	𐡉	𐤉	Ι	Ι	Ι	I	I	i	i	Ι	ι	ι	І
क	𐨊	ከ	𐩻	ك	ك	ܟ	כ	𐤊	𐡊	𐤊	Κ	Κ	Κ	K	K	k	k	Κ	κ	κ	К
ल	𐨋	ለ	𐩼	ل	ل	ܠ	ל	𐤋	𐡋	𐤋	Λ	Λ	Λ	L	L	l	l	Λ	λ	λ	Л
म	𐨌	መ	𐩽	م	م	ܡ	מ	𐤌	𐡌	𐤌	Μ	Μ	Μ	M	M	m	m	Μ	μ	μ	М
न	𐨍	ነ	𐩾	ن	ن	ܢ	נ	𐤍	𐡍	𐤍	Ν	Ν	Ν	N	N	n	n	Ν	ν	ν	Н
स	𐨎	ሠ	𐩿	س	س	ܣ	ס	𐤎	𐡎	𐤎	Ξ	Ξ	Χ	X	X	x	x	Ξ	ξ	ξ	
ए	𐨏	ዐ	𐪀	ع	ع	ܥ	ע	𐤏	𐡏	𐤏	Ο	Ο	Ο	O	O	o	o	Ο	ο	ο	О
प	𐨐	ፈ	𐪁	ف	ف	ܦ	פ	𐤐	𐡐	𐤐	Π	Π	Π	P	P	p	p	Π	π,ϖ	π	П
श	𐨑	ጸ	𐪂	ص	ص	ܨ	צ	𐤑	𐡑	𐤑	ϻ	Ϙ	Ϙ	Q	Q	q	q	Ρ	ρ	ρ	Р
ल	𐨒	ቀ	𐪃	ق	ق	ܩ	ק	𐤒	𐡒	𐤒	Ϟ	Ρ	Ρ	R	R	r	r	Ρ	σ,ς	ϲ	С
ज	𐨓	ረ	𐪄	ر	ر	ܪ	ר	𐤓	𐡓	𐤓	Σ	Σ	Σ	S	S	s	s	Σ	τ,ϯ	τ	Т
त	𐨔	ሰ	𐪅	ش	ش	ܫ	ש	𐤔	𐡔	𐤔	Τ	Τ	Τ	T	T	t	t	Τ	υ	υ	
		ተ	𐪆	ت	ت	ܬ	ת	𐤕	𐡕	𐤕	Υ	Υ	Υ	U	U	u	u	Υ	φ	φ	Ф
												Φ	Φ					Φ	χ	χ	Х
												Χ	Χ					Χ	†	ψ	
												Ψ	Ψ					Ψ	ω	ω	Ѡ
												Ω									

opinion that Crete rather than Egypt is the original home of our alphabet.

The Hebrew alphabet now employed is not the original one, but has an Aramaic origin, having been adopted some time after the Captivity. The Hebrew alphabet proper, as we find it on ancient coins, is evidently the same as that of the Phœnician inscriptions. The names of the letters in Phœnician and Hebrew must have been almost the same, for the Greek names, which, with the letters, were borrowed from the former, differ little from the Hebrew. By means of the names we may trace the process through which the Egyptian characters were transformed into letters by the Phœnicians. Some Egyptian character would, by its form, recall the idea of a house, as for example, in the Phœnician or Hebrew *beth*. This character would subsequently come to be used wherever the articulation *b* occurred, whether in the beginning, middle or end of a word. Its form might be afterward simplified, or even completely modified, but the name would remain, as *beth* still continues the Hebrew name for *b*, and *beta* the Greek. Our letter *m*, in Hebrew called *mim*, water, has still a considerable resemblance to the zigzag wavy line chosen to represent water, as in the zodiacal symbol for *Aquarius*. The letter *o*, of which the Hebrew name means eye, was originally intended to represent that organ.

The Semitic alphabets are written from right to left. The earliest Greek inscriptions, at Thera, are written in a character much like Phœnician, either from right to left, or from left to right, or *boustrophedon*, with the lines alternating in direction. The Greek alphabet did not definitely assume its final form until comparatively late. It is the Ionian (see accompanying plate (Eastern Greek) in the form which it assumed at Halicarnassus) which gave rise to the modern Greek "capitals," while the alphabets of Italy, such as Latin, Etruscan, etc., were offshoots from an Eubœan stock.

The later Greek alphabet furnished elements for the Coptic, the Gothic and the old Slavic alphabets. The Latin characters are now employed by many nations, such as the Italian, the French, the Spanish, the Portuguese, the English, the Dutch, the German, the Hungarian, the Polish, etc., each having introduced such modifications or additions as are necessary to express the sound of the language peculiar to it. The Greek alphabet has only 17 letters, taken directly from the Phœnician, though the Phœnician alphabet had 22 letters. These were the five vowels, *a*, *e*, *ι*, *o*, *υ*, (*a*, *e*, *i*, *o*, *u*, as in French) and the 11 consonants, *β*, *γ*, *δ*, *κ*, *λ*, *μ*, *ν*, *π*, *ρ*, *σ*, *τ*, (*b*, *g*, *d*, *k*, *l*, *m*, *n*, *p*, *r*, *s*, *t*). According to one tradition, Palamedes, a contemporary of the Trojan war, invented *ξ* (*x*) and the three aspirates *θ*, *φ*, *χ*, (*th*, *ph*, *ch* guttural). To Simonides was attributed the invention of the double consonants *ζ* and *ψ* (*ds* or *z*, and *ps*) and the two long vowels *η* and *ω* (*ē* and *ō*), which completed the Greek alphabet of 24 letters as still used. Besides these, there were anciently the *digamma*, a character corresponding pretty nearly to *v*, which afterward slipped out of the Greek alphabet; and the character ' representing an aspirate at the beginning of words. The original Latin alphabet, as it is found in the oldest inscriptions, consisted of 21 letters; namely, the vowels *a*, *e*, *i*, *o* and *u* (*v*), and the consonants *b*, *c*, *d*, *f*, *g*, *h*, *k*, *l*, *m*, *n*, *p*, *q*, *r*, *s*, *t*, *x*. *Z* slipped out at an early period, and *g* took its place. To these we might also add the characters *æ* and *œ*, representing the Greek diphthongs *αι* and *αι*. The letters *i* and *u*, it must be remarked, had a double force, that of a vowel and that of a consonant. In the latter case they were, after the introduction of printing, changed frequently into *j* and *v*. The *i* consonant, as in *inventus* (youth), had a sound resembling that of *y* in English or *j* in German; *u*, consonant, as in *uespa* (*vespa*), a wasp, had a sound much like the English *w* — *wespa*. (At least this opinion appears best supported by the evidence). No genuine Latin word contains either *y* or *z*, these being used in foreign (chiefly Greek) words adopted into the language; and *k* is found in classical Latin only in *Kalendæ*. Our modern lower-case letters and script represent adaptations of the Carolingian minuscule of the 9th century, which itself was descended from the uncials or book-hands of still earlier periods. The most important of these were the Roman uncial, which is essentially made up of rounded capital forms, and the Irish semi-uncial, which shows traces of influence by an antecedent cursive script or running hand. The modern Greek minuscule is likewise the result of the interaction of uncial and cursive forms.

While the alphabets of the west of Europe are derived from the Latin, the Russian and other Slavonic alphabets of the east come from the Greek. The modern Russian, consisting of 35 letters, is a modification and simplification of the ancient Cyrillic alphabet, invented by Cyril in the 9th century in order to translate the Gospels into the language of the Slavs of Bulgaria and Moravia. It was formed of Greek letters, together with some that had been differentiated from Greek ligatures. The Anglo-Saxon alphabet (see ANGLO-SAXON) had two letters for the two sounds of *th*, which appear to have come from the Greek through the Mœso-Gothic, and which were unfortunately not retained in later English. It wanted the letters *j*, *k*, *q*, *v*, *z*, but it had the sound *æ*. The German alphabet consists of the same letters as our own, the common German characters being mere modifications of the Roman, but the sounds of some of them are different. Anciently certain characters called Runic (q.v.) were made use of in Germany and Scandinavia, to which some would attribute an origin independent of the Greek and Latin alphabets, although it is pretty well established that both Greek and Latin played a part in their origin. Among Asiatic alphabets the Arabian, which, like Hebrew, is of Aramaic origin, has played a part exactly analogous to that of the Latin in Europe, the conquests of Mohammedanism having imposed it on the Persian, an Aryan language; the Turkish, a Tatar language; the Hindustani, also an Aryan language; and even the Malay. It consists of 28 letters, and appears to derive its origin from the Sinaitic alphabet, employed during the first centuries of the Christian era, and found in inscriptions in the Sinaitic peninsula, at Petra, in the Hauran, etc. Other alphabets of Aramaic origin are used for Syriac, Mongolian and Manchu. Beside these alphabets of North Semitic origin there is a group

of alphabets indigenous to southern Arabia. A specimen which appears to be of this stock, though it comes from Safa, near Damascus, is shown in the accompanying table. Though the relation of these forms to those of Phœnicia is unquestioned, the precise nature of this relation is unknown. The alphabets or syllabaries of Abyssinia are South Semitic in character, as is shown by the Amharic alphabet pictured. It has also been maintained by Bühle, and vigorously denied by other writers, that the alphabet used in the edicts of the great Indian monarch, Asoka (255–223 B.C.), is of South Semitic origin. The Nagari alphabet, used in writing Sanskrit, comes from this stock. This alphabet is one of the most remarkable alphabets of the world. As now used it has 14 characters for the vowels and diphthongs, and 33 for the consonants, besides two other symbols. The vowel *a* short is to be understood after every consonant, unless excluded by another vowel immediately attached to the consonant. (See SANSKRIT; also articles on the various Indian languages). Our alphabet is by no means a perfect instrument for what it has to perform, but is both defective and redundant. It is estimated that there are 42 sounds in the language, and only 26 letters to represent them. *A*, to begin with, has to do duty for many different sounds, as in *far, fat, fall* and *fame; o* has three sounds, as *not, note* and *move; e* has a long sound and a short, as in *mete* and *met. C* is a useless letter altogether, since it has always either the sound of *s* or of *k*. Others of the consonants encroach upon one another's provinces; *g*, for example, sounds sometimes like *j*, as in *digest; f* sounds *v* in *of; s* sometimes usurps the sound of *z*, as in *raisin*, sometimes that of *zh* or *sh*, as in *pleasure*. See articles on the various languages mentioned and on the several letters of the alphabet, and HIEROGLYPHICS; PALÆOGRAPHY; PHONETICS; WRITING. Consult Berger, P., 'Histoire de l'écriture dans l'antiquité' (Paris 1891); Dodds, E., 'The Story of the Alphabet' (1900); Evans, A. J., 'Scripta Minoa' (Vol. I, 1909); Faulmann, 'Illustrierte Geschichte der Schrift' (1880); Kirchoff, A., 'Studien zur Geschichte des griechischen Alphabets' (4th ed., 1887); Larfeld, W., 'Handbuch der griechischen Epigraphik' (1902–07); Lidzbarski, article in *Jewish Encyclopedia*, and 'Nordsemitische Epigraphik' (1898); Reinach, S., 'Traité d'épigraphie grecque' (1885); Roberts, E. S., 'Introduction to Greek Epigraphy' (1887–1905); Steffens, 'Lateinische Palæographie — Tafeln' (1903); Taylor, I., 'The Alphabet' (London 1883); Thompson, E. M., 'Handbook of Greek and Latin Palæography' (3d ed., 1906).

NORBERT WIENER.

AL-PHASI, äl-fä'zî, or **RIPH, Isaac**, Hebrew rabbi: b. Fez, 1013; d. Lucena, 1103. As a codifier, simplifying Talmudic teachings and freeing them from controversial detail, Al-Phasi's digest 'Halakhoth' or 'Decisions' was the basis of the codes of Maimonides and Quaro. Exiled at 75 years of age Al-Phasi, the "man of Fez" as he was called, settled in Lucena, Spain, where his pupil and successor as rabbi, Joseph ibn Magash, became the teacher of the celebrated Maimonides.

ALPHEUS, Greece, the modern Ruphia, river of Peloponnesus, which rises near Asca in southern Arcadia, and flows through Elis and the Olympian plain to the Ionian Sea. It is the classic river famous for the myth of the love of Alpheus for Arethusa. Arethusa bathing in the river is said to have escaped from the enamored river-god through the intervention of Diana who transformed her into a fountain, transporting her to Ortygia, modern Sicily. But Alpheus, pursuing through a subterranean course emerged in Sicily, and was happily united to the Arethusian fountain.

ALPHONSINE TABLES. See ALFONSO X.

ALPHONSUS A SANCTA, Maria, Spanish historian and bishop of Burgos: b. 1396; d. 1456. Celebrated for his learning, his most important work is a history of Spain from the earliest times to 1456, entitled 'Rerum Hispanorum Romanorum imperatorum, summorum pontificum, nec non regum Francorum anacephaleosis' (Granada 1545).

ALPHONSUS DEI LIGUORI, Saint: b. Naples of noble parents at the end of the 17th century; d. 1787. At the age of 16 he took his degree of Doctor in Civil and Canon Law in the University of Naples and immediately entered the legal profession. This he soon abandoned in order to become a priest and to dedicate his life to the service of the poor in the villages of southern Italy. To assist him in these labors of teaching the poor peasants, he founded the Congregation of the Holy Redeemer, whose members are commonly known to-day in the United States as "Redemptorists." He was made bishop of St. Agatha by Clement XIII. After 25 years of fruitful labor in this field, he returned to his monastery at Nocera, where he died. His virtues and learning have made him one of the best known saints in the Catholic Church. He was canonized in 1839 by Gregory XVI, and in 1871 was proclaimed by Pius IX a Doctor of the Universal Church. His writings deal chiefly with moral theology in theory and practice. His feast is celebrated on 2 August. The first authoritative work on St. Alphonsus was written by one of his scholars, P. Tannoiaand, and is entitled 'Vita et Instituto del Venerabile Servo di Dio' (3 vols., Naples 1802). In French, an exhaustive work in four volumes by Cardinal Villecourt, 'Vie et institut de Saint Alphonse de Ligouri' (1863); in English, vid. Butler's 'Lives of the Saint,' and 'Life' by Bishop Mullock.

ALPINE CLUBS, organizations for the exploration and study of mountains. The original club is the famous Alpine Club of England, organized in 1858, which publishes the *Alpine Journal*. The first American Alpine Club was organized in 1873. There are in the United States the "Mazamas" and Sierra clubs on the Pacific coast, and the Appalachian Club on the Atlantic. See MOUNTAIN CLIMBING.

ALPINE PLANTS, plants indigenous to high altitudes. The most striking features common to them all are adaptations to rigorous climate such as the dwarfing of the stems of trees and shrubs, but not of roots or flowers, which may even be increased in size over those of similar plants grown in milder places;

gnarled and crooked habit; horizontal or creeping rather than upright growth (the height of the taller species indicating the approximate depth of snow); and the development of structures that tend to check evaporation. Of these last a thickened epidermis, as in conifers, and epidermal hairs, as in edelweiss, are the most striking.

ALPINI, al-pē'nē, **Prospero**, Italian botanist and physician: b. Marostica 1553; d. Padua 1617. During the management of date plantations in Egypt, he discovered the sexual difference of plants and the fertilization of female flowers from the male, which Linnæus adopted as the foundation of his system, also naming the genus Alpinia of the order Zingiberaceæ in his honor. Alpini's 'De Medicina Egyptiorum' (Venice 1591) contains the first description of the coffee plant known in Europe. 'De Plantis Ægypti liber' (Venice 1592) is his most important work.

ALPS, the most remarkable and interesting system of mountains in Europe. It covers a great part of northern Italy, several departments of France, nearly the whole of Switzerland and a large part of Austria, while its ramifications in Italy and Germany, and extending far toward the southeast, connect it with nearly all the mountain systems of Europe. The name is derived from the Celtic *alb*, which by some is made to signify white, by others height. In the immediate neighborhood of the mountains *alp* has a peculiar meaning, and signifies one of the high pastures for which the Alps are distinguished. This great congeries of mountains may be said to be included between lat. 44° and 48° N.; and long. 5° and 18° E. The culminating peak of the whole system is Mont Blanc, 15,781 feet high, though the true centre is St. Gothard, or rather the mountains between the sources of the Rhone and the Inn, and the Swiss cantons Valais, Bern Uri and Grisons on the north; and cantons Tessin and Lombardy and Sardinia on the south. It is a curious fact that its great central mass is nearly equidistant from the pole and from the equator. From its slopes flow, either directly or by affluents, the great rivers of central Europe, the Danube, Rhine, Rhone and Po. Round the northern frontier of Italy the Alps form a remarkable barrier, shutting it off at all points from the mainland of Europe, so that, except in the valley of the Adige, where a remarkable break occurs in the chain, or at the opposite extremity at Nice, it can only be approached from France, Germany or Switzerland through high and difficult passes. Accordingly nearly all the great passes of the Alps are connected with roads from the northern kingdoms into Italy. In this connection see ITALY: HISTORY AND MODERN DEVELOPMENT; 1, PHYSICAL GEOGRAPHY; *Mountains*.

As usual with mountain systems of great altitude, the highest peaks of the Alps are reached by a gradual ascent through a succession of outer ranges and elevated intermediate valleys. The total width of the system is therefore always great and can hardly anywhere be measured with precision, opinion varying as to the points at which the outer limits should be fixed. Toward the east, however, the system, while it diminishes in height, becomes more widely extended, some of the transverse valleys extending to 150 miles, while that of the Drave reaches 200. From Bellinzona, in the canton of Tessin, to Altdorf, in that of Uri, the distance is 50 miles. The outer range is called by the Italians *Pre-alpi*, by the Germans *Voralpen*. The main chain of the Alps, which commonly determines the watershed of the countries through which it passes, contains some of the highest peaks; but at several points there are extensive ramifications of the system proceeding at various angles from the main chain, and more or less connected with it, and which sometimes exceed in mass and altitude the corresponding parts of the principal chain. Such are the Alps of Dauphiné and Savoy, and the Bernese Alps. The principal valleys of the Alps run mostly in a direction nearly parallel with the principal ranges, and therefore east and west. The transverse valleys are commonly shorter. In the section called the Lepontine Alps, however, long ranges run north and south, forming valleys transverse to the dividing line of the waters, and terminating in the great Italian lakes. The slopes toward the south are more precipitous than toward the north, and as most of the collateral ranges lie to the north of the main chain the great valleys are mostly to be found in the intervals between them. The transverse valleys of the Alps frequently lead up through a narrow gorge to a depression in the main ridge between two adjacent peaks. These are the passes or *cols*, which are found by tracing a stream which descends from the mountains up to its source. The col is usually found to receive the drainage of the neighboring peaks, and when it is of sufficient extent a small lake is generally formed, from which a stream flows down on each side. When the one stream has been traced up to its source the passage across the mountains is completed by following the course of the other. The principal passes, now well known, are more than 50 in number; but there are many others more difficult and dangerous which have never had more than a local reputation.

The common divisions of the Alps have been taken from the Romans, whose acquaintance with the Alps as the northern boundary of Italy was considerable, yet their classification, being formed mostly for practical purposes, was far from complete. Several modern divisions have been added. The Romans were acquainted with many of the best passes, to which from their altitude they gave the name of *Mons*. Before noticing these divisions a glance may be taken at the general direction of the main chain. The most convenient starting-point is on the Mediterranean coast, near Nice. Eastward the chain proceeds along the coast till it forms a junction with the Apennines, which may be considered as one extremity of the system. In the opposite direction it proceeds northwest, and afterward north on the boundaries of France and Italy to Mont Blanc; it then turns northeast and runs generally in this direction to the Gross Glockner, in central Tyrol, between the Drave and the Salza, where it divides into two branches, the more northerly of which proceeds northeast toward Vienna. The southern chain subdivides again, one branch running in a southerly direction, connects itself with the mountains of Dalmatia, and by a southeasterly continuation with the Balkans and the mountains of Greece; the middle branch proceeds

toward the Drave and Danube. With these continuations, which lose themselves insensibly in other ranges, the Alps may be considered to terminate.

The Maritime Alps.— The first great division of the Alps extends from their junction with the Apennines to Monte Viso, a distance of about 100 miles. This mountain is the most prominent object from the basin of the Po, wherever the Alps are visible. The division of the Alps from the Apennines has been variously fixed at Col di Tende and Col d'Altare, near Savona. The northern limit of the Maritime Alps is to the south of Monte Viso. The culminating-points are the Aiguille de Chambeyron, 11,155 feet, and the Grand Rioburent, 11,142 feet. The principal pass is the Col di Tende (6,158 feet), which was made practicable for carriages by Napoleon. It leads from Nice to Turin. The road is dreary, but commands a view of the Alps from Col d'Iséran to Monte Viso. There are carriage roads over the Col di San Bernardo and Col di Nava. Numerous tributaries of the Po and the Durance with the Var and other lesser rivers rise in the Maritime Alps.

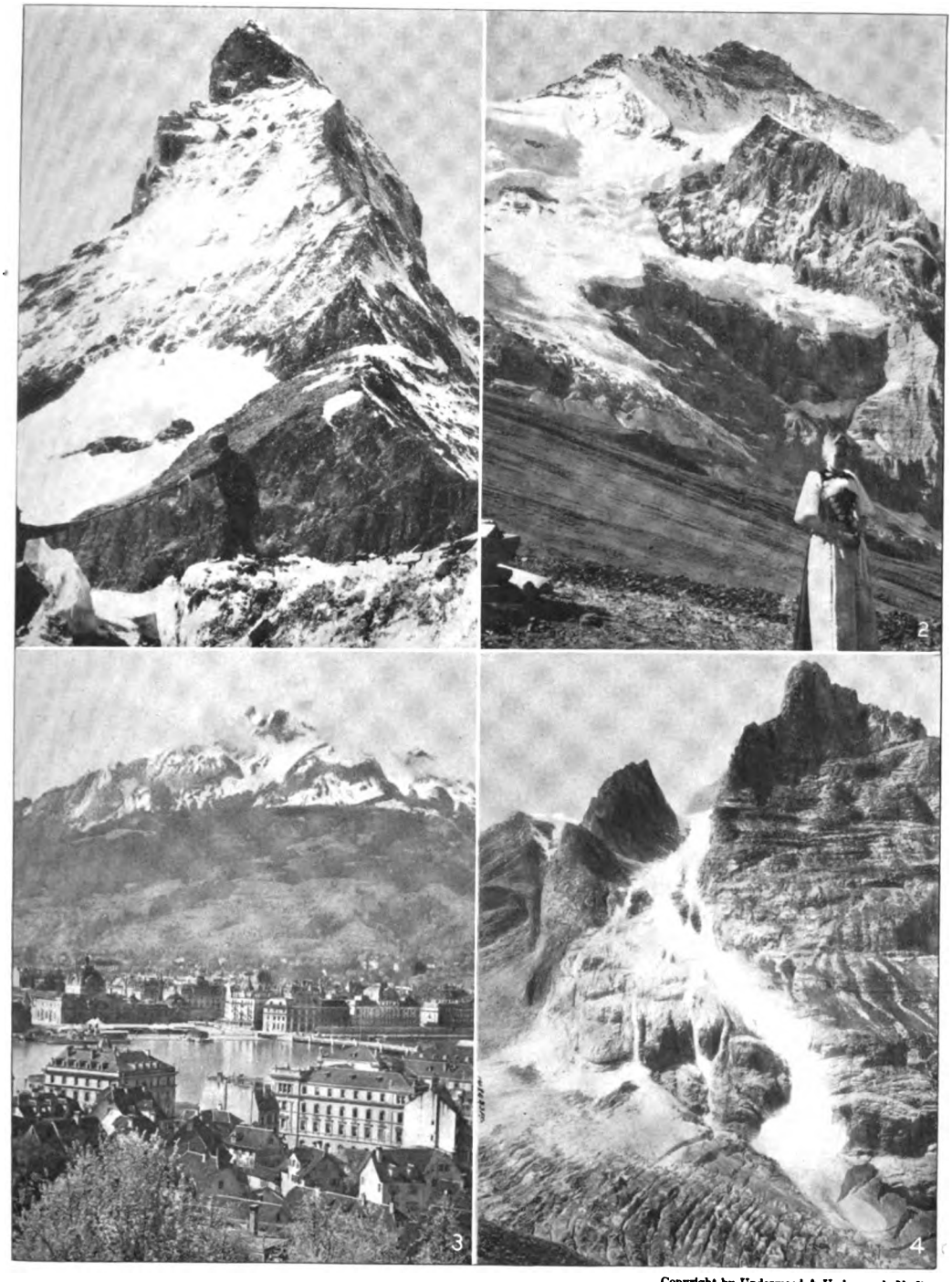
The Cottian Alps.— Anciently named after a chief of the district, and extending from Monte Viso to Mont Cenis, these consist of numerous mountain masses irregularly grouped, the main line running northeast, and the principal ramifications to the west of it. The length is about 60 miles. Modern geographers distinguish, as a separate group divided from the main chain by the valley of the Durance, the so-called Dauphinese or Dauphiné Alps. These contain loftier peaks than the main chain. Principal peaks of the Cottian Alps: Monte Viso, 12,605 feet; Chardonnet 12,373; Ciamarella, 12,081; of the Dauphines Alps: Pic des Écrins, 13,462; La Meije, 13,081; Pelvoux, 12,973. There is a carriage road by Mont Genèvre (6,102 feet) between the valleys of the Durance and the Dora Ripaira, and by the Col de Sestrières (6,335 feet) from Cesanne to Pignerolo. The road by the former, Cesanne to Briançon, was constructed by order of Napoleon. The difficult pass of Col de la Roue, Bardonnèche to Modane, is that supposed to have been traversed by Cæsar in order to attack the Helvetians. The Durance and the Dora Ripaira rise in the Cottian Alps.

The Graian Alps.— From Mont Cenis this group extends to Mont Blanc (50 miles) and has extensive ramifications in Savoie and Piedmont. The principal peaks are, in the main chain, Aiguille de la Sassière, 12,326 feet; in the Piedmontese group, Grand Paradis, 13,300; in the Savoie group, Grande Casse, 12,780. Mont Cenis (6,765 feet), the most frequented of all the Alpine passes, was crossed by Pepin to attack the Lombards. A carriage road over it was constructed by Napoleon in 1803–10, leading from the valley of the Arc to Turin, and uniting with the road from Mont Genèvre at Susa. A railway now passes through the mountain by a tunnel nearly eight miles long (See CENIS). The pass of Little St. Bernard (7,192 feet) lies between the valleys of the Isère and Aosta. It was made practicable for cars by Augustus, but is now only available for mules. It appears to have been the road taken by Hannibal. The Col de Bonhomme (8,195 feet) communicates with the Col de la Seigne (8,327 feet) in the Pennine Alps. They lead by a mule path from Contamines to Courmayeur. The Stura, and Orca, and the Arc and Isère, rise in the Graian Alps.

The Pennine Alps (Celtic, *pen* or *ben*, a hill) is the loftiest range of the whole system, having Mont Blanc at one extremity and Monte Rosa at the other (60 miles). Here also begin the most extensive ramifications of the system, some of the collateral ranges rivaling or exceeding in mass and altitude the main chain. The Alps of Haute Savoie form a northwestern continuation of this range. The northern boundary of the Pennine Alps is the Valais, or upper valley of the Rhone. On the opposite side of this valley, and nearly parallel with the main chain, runs the great range of the Bernese Alps. Here the grandest panoramas of Alpine scenery are exhibited. The great peaks of the two vast ranges are only about 20 miles apart, and between them run transverse ranges presenting innumerable secondary heights. From the Matterhorn (Mont Cervin), between Mont Combin and Monte Rosa, a series of great heights, including the Weisshorn and the Gabelhorn, run to the north. The main range contains Mont Blanc, Monte Rosa and Mont Cervin, three of the highest peaks in Europe. On the west the Bernese Alps are connected with the Jura range. The principal heights of the Pennine Alps are Mont Blanc, 15,781 feet; Monte Rosa, 15,217; Mischabelhörner (Dom), 14,935; Lyskamm, 14,889; Weisshorn, 14,804; Matterhorn, 14,780. In the Bernese Alps are the Finsteraarhorn, 14,026; Aletschhorn, 13,803; Jungfrau, 13,671. There are bridle passes, the Col de la Seigne, already mentioned, and the Col de Ferret (8,320), on each side of Mont Blanc. The pass of Great St. Bernard is celebrated for its hospice (See BERNARD, GREAT ST.). It was crossed by Napoleon in 1800, but it is not practicable for carriages. There are several passes, as the Col du Cervin, the Schwarzthor and the Col du Lys, from 10,000 to 14,000 feet in height. The most easterly pass is the Simplon, 6,595 feet, from Brieg to Domo d'Ossola. It has a carriage road made by Napoleon. This is about 36 miles long and 25 feet wide throughout, and is carried over steep precipices and through six galleries hewn in the rock. The Grande Galerie is 683 feet long. A double railway tunnel, the longest and lowest tunnel through the Alps (12¼ miles long and 2,313 feet above sea-level), has been driven through the Simplon. Numerous tributaries of the Rhone rise in the valley between the mountains, and on the Italian side the Dora Baltea, Sesia and other rivers.

The Lepontine Alps form the continuation of the main chain on the south side of the great valley or depression stretching from Martigny in the Valais to Coire in the Grisons, the western portion of which forms the basin of the Rhone, the eastern that of the Vorderrhein. From this chain branch the northern and eastern extensions of the Swiss Alps beyond the Bernese range, the eastern boundary of which is fixed at the defile of the Devil's Bridge, near Andermatt, crossed by the Reuss. The Lepontine range extends to the Splügen pass. The line of watershed is generally parallel to the valley of the Vorderrhein; but here, as already noticed, some of the principal ranges run transversely to it, terminating in the great

ALPS



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1 The Matterhorn, Switzerland
2 The Jungfrau, Switzerland
3 Mount Pilatus, Switzerland
4 Avalanches in the Swiss Alps

valleys in which lie the lakes Maggiore, Como, etc., fed by numerous tributaries from this and the following division of the Alps. This division forms the great water-parting of the whole system. Within a radius of a few miles from the St. Gothard Pass rise the Rhone, the Aar, the Reuss, the Vorderrhein, the Ticino, the Toccia and the Maggia. The principal pass is the St. Gothard (6,936 feet), over which pass is a carriage road from Bellinzona to Altdorf. Through this mountain mass a railway tunnel more than nine miles long was opened in 1882. The Gries Pass (8,050 feet) conducts from Obergestelen to Formazza. The Bernardin Pass (6,769 feet), constructed by the Swiss government, leads from Coire to Bellinzona. The road from Coire to the Splügen leads, by way of the Splügen Pass (6,945 feet), to Lake Como. This route commands the finest views of Swiss scenery in the Grisons. Previous to the construction of the present road by the Austrian government in 1823 it was difficult and dangerous. Marshal MacDonald, who crossed it in 1800, lost a large number of men by avalanches at a gorge in the passage of the Cardinello, which the new road avoids. The carriage road over the Furka Pass from Obergestelen to Andermatt, completed in 1867, affords a fine view of the Schreckhorn and Finsteraarhorn. The peaks here are of less elevation. The highest, Monte Leone, is 11,696 feet; the Piz Valrhein is 11,148 feet, and several are above 10,000. Of the northern ranges Tödi is 11,887; Bifertenstock, 11,237; Scheerhorn, 11,132, and there are many above 10,000.

The Rhætian Alps extend from the Splügen to Dreiherrnspitz on the borders of Salzburg and Tyrol. The Engadine, or valley of the Inn, divides them into two portions. The chain is also broken by the valley of the Adige. To the south, separated by the valley of the Adda, are the Lombard Alps, while the more northerly continuations embrace the Tyrolese and Bavarian Alps. In the main range are the Piz Bernina, 13,294 feet; Piz Roseg, 12,936; Ortelerspitze, 12,814; in the Lombard Alps, Monte Adamello, 11,832; Presanella, 11,688; and Care Alto, 11,352. The other ranges are inferior in height. Good roads now become more numerous. The Malloya Pass (5,942 feet) leads from Chiavenna, by the valley of the Inn, to Innsbruck, and communicates with the road over the Julier Pass (7,503 feet) to Coire. The Pass of Glurns (4,400 feet), from the valley of the Inn to the Adige, is the lowest pass over the main chain. It joins the road to Milan by the Valtelline, the highest part of which is 9,174 feet. This is a carriage road constructed by the Austrian government for communication with their Lombard dominions. The Brenner Pass (4,588 feet) leads from Verona to Innsbruck. The Brenner is crossed by a railway. The northern ranges are intersected by the Septima, Julier, Albula and other passes. The Adda, Oglio, Adige, Hinterrhein, Inn and other rivers, rise in this part of the chain.

Noric Alps.— The main chain of the Alps here divides into different sections as already mentioned. The northern part of the chain extending to Vienna was anciently called the Noric Alps, while the southern continuations were known as the Carnian and Julian Alps, the names Venetian, Dalmatian, and Pannonic Alps being also in use. The culminating peak of the northern range is the Gross Glockner, 12,405 feet. Farther east the heights are of much less elevation. In Carinthia and Styria two parallel branches called the Styrian Alps enclose the upper valley of the Mur. In this group is the Hafnereck, 10,044 feet. In south Tyrol and Venetia several peaks rise above 10,000 feet. The Carnic Alps run from the frontiers of Tyrol and Venetia to the frontier of Carinthia. They are separated from the northern range by the Gailthal. The height of the southeastern continuations of the Alps rapidly diminishes, and they lose themselves in ranges having nothing in common with the great mountain masses which distinguish the centre of the system. Mount Terglou, near the northwestern extremity of the Julian Alps, has a height of 9,371 feet. The name Dinaric Alps is given to a continuation from Mount Klek through Croatia and along the borders of Dalmatia and Herzegovina.

There are various points of vantage from which extensive views of Alpine scenery are commanded at the expense of a moderate amount of climbing. The Rigi, which can now be ascended by railway, is one of these. There are hotels at the top, 5,905 feet above the level of the sea, and 4,468 above the Lake of Lucerne. A favorite Rigi spectacle is that of the sun rise over the Bernese Alps. The Faulhorn (8,799 feet), southeast of Lake Brienz, commands a near view of the same range. The Becca di Nona (8,415 feet), south of Aosta, gives, according to some authorities, the finest panoramic view to be obtained from any summit of the Alps. From the Gorner Grat (to which there is now a railway from Zermatt), and various points in the valley of Chamonix, particularly the Montanvert, with its outlook upon the Mer de Glace, views of various interest are obtained. The most accessible Alpine glaciers are those of Aletsch, Chamonix and Zermatt.

Climate.— In the lower valleys the mean temperature ranges from 50° to 60°. Half-way up the Alps it averages about 32° — a height which, in the snowy regions, where snow always lies, the average does not attain. The exhilarating and invigorating nature of the climate in the upper regions of the Alps during summer has been acknowledged by all who have visited these romantic scenes. The freshness of the breeze as it comes from the snowy peaks, tempered by the rays of a southern sun, enables the traveler, without weariness, to perform distances on foot that at home he would have shrunk from attempting. Notwithstanding, however, the invigorating nature of the climate, the inhabitants of the higher valleys are often afflicted with goitre and cretinism.

Botany and Zoology.— In respect to vegetation the Alps have been divided into six zones. The limits of these depend not on absolute height, but on height modified by exposure and local circumstances. The lowest is the olive zone. This tree flourishes better on sheltered slopes of the mountains than on the plains of northern Italy. The vine, which bears a greater winter cold, distinguishes the second zone. On slopes exposed to the sun it flourishes to a considerable height. The third is the mountainous zone or region. Cereals and deciduous trees form the distinguishing features

of its vegetation. The mean temperature about equals that of Great Britain, but the extremes are greater. The fourth region is the sub-Alpine or coniferous. Here are vast forests of pines of various species, which have in many places been inconsiderately cut down, the result being that the valleys have been deprived of shelter and denuded of soil. Most of the Alpine villages are in the two last regions. On the northern slopes pine forests extend to 6,000, and on the southern slopes to 7,000 feet above the level of the sea. This is also the region of the lower or permanent pastures where the flocks are fed in winter. The fifth is the pasture region, the term *alp* being used in the local sense of high pasture grounds. It extends from the uppermost limit of trees to the region of perpetual snow. The landscape is adorned with numerous shrubs; rhododendrons, junipers, bilberries and dwarf willows being among the distinctive forms of vegetation. The sixth is the region of perpetual snow. The line of snow appears from a distance to be continuous at a limit which varies, according to seasons and localities, from 8,000 to 9,500 feet, but on approaching this apparently continuous line it is found to be broken up and crossed by patches of brilliant vegetation, the limit of which appears to be imposed by want of soil rather than severity of climate. Few flowering plants extend above 10,000 feet, but they have been found as high as 12,000 feet. At this great elevation two species of quadrupeds may be seen, the bouquetin or wild goat, and the chamois, which delight in heights inaccessible to man. The bouquetin, which has become very rare, scales the most elevated peaks, while the chamois is generally found rather lower, but is never seen in the plains. In summer the high mountain pastures are covered with large flocks of cattle, sheep and goats, which in winter are removed to a lower and warmer level. The marmot and white or Alpine hare inhabit both the snowy and the woody regions. Lower down are found the mole, the wildcat, the fox, the lynx, the bear and the wolf; but the last two are now extremely rare. The vulture, eagle and other birds of prey frequent the rugged Alpine rocks, and "the snowy ptarmigan" seeks food and shelter among the diminutive plants that border upon the snow-line. Other kinds of game, including the grouse, woodcock and partridge, may be found from the upper limit of the woods to the more level and habitable parts below. Several kinds of water-fowl frequent the higher lakes, where excellent trout and other fish are found; but those lakes situated at the greatest elevation are, from their low temperature, entirely destitute of fish.

Geology and Minerals.— The geological structure of the Alps forms the subject of, or is incidentally discussed in, many books of great distinction, some of which we include among the works mentioned in the bibliography below. In general three zones can be distinguished, a central, in which crystalline rocks prevail, and two exterior zones, in which sedimentary rocks predominate. The rocks of the central zone consist of granitic gneiss of various forms, seldom pure granite, gneiss, hornblende, mica slate and other slates and schists. In the western Alps there are also considerable elevations in the central zone that belong to the Jurassic (Oolite) and Cretaceous formations. From the disposition of the beds, which are broken, tilted and distorted on a gigantic scale, the Alps appear to have been formed by a succession of disruptions and elevations extending over a very protracted period. The large beds of calcareous rock which overlie the older rocks both to the east and west appear to have been ruptured and rolled back by the upheaval of the central mass. Mining is not carried on to an extent proportionate to the magnitude of the mountain range. Iron and lead, however, are found in considerable abundance, and the Bleiberg (lead mountain) mine, in Carinthia, furnishes the purest lead in Europe. Rock-salt is abundant toward the north of the chain, and the salt works of Bex in Canton de Vaud, of Hall in Tyrol, of Hallein and of Berchtesgaden in the vicinity of Salzburg, are of note. Mercury exists chiefly in the east part; the richness of the mine of Idria, northwest of Trieste, is well known. Besides those principal products, gold, silver, copper, zinc and coal are mined to some extent.

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MARRION WILCOX.

ALSACE-LORRAINE, ăl-săs-lō-rān' (German, *Elsass-Lothringen*), a district occupying the extreme southwest corner of Germany, bounded west by France, east by Baden and south by Switzerland. Its length from north to south is 123 miles; its breadth varies from 22 to 105 miles; and its area is 5,580 square miles, of which 1,353 belong to Upper Alsace (in the south), 1,844 to Lower Alsace (northeast) and 2,383 to Lorraine (northwest). Pop. (1910) 1,874,014, of which 1,428,343 are Roman Catholics, and more than 80 per cent speak German — mainly the vernacular Alsatian, a dialect of Alemannian. The most populous districts in their order are Lower Alsace, Lorraine and Upper Alsace. The French-speaking population is mainly in the larger towns and

in Lorraine. The Rhine flows 115 miles north by east, along all the eastern border, and receives, below Strasburg, the Ill from Alsace, 127 miles long. Other rivers are the Moselle, flowing through Lorraine past Metz, and its affluent, the Saar. Along the Rhine is a strip of level country, 9 to 17 miles broad and declining from 800 to 450 feet above sea-level. Westward of this rise the Vosges Mountains, culminating at a height of 4,677 feet; while Lorraine, rather hilly than mountainous, rarely attains 1,300 feet. About 48.5 per cent of the entire area is arable, 11.6 meadow and pasture and 30.8 under wood. Alsace-Lorraine produces much wine, grain and tobacco; it is rich in mines, iron and coal; and manufactures iron, cotton, wool, silks, chemicals, glass and paper. It contains the important cities of Strassburg (pop. 1905, 167,678); Metz (pop. 1910, 68,598); Kalmar (pop. 1910, 43,808). As a French province, Alsace was divided into the departments of Haut-Rhin and Bas-Rhin. Lorraine fell into the departments of Meuse, Moselle, Meurthe and Vosges (parts of all which still remain French). The lieutenant-governor (*Statthalter*), representing the imperial government, resides at Strasburg, and is assisted by a ministry of five departments and a council of state.

From the 10th century Alsace-Lorraine formed part of the German empire till a part of it was ceded to France at the Peace of Westphalia (1648). and by the Peace of Ryswick (1697) the cession of the whole was ratified. German never ceased to be the chief language of the people, and all newspapers were, during the whole period of the French possession, printed in both languages. In 1871, after the Franco-Prussian war, Alsace and German Lorraine were, by the Treaty of Frankfort, incorporated in the new German empire. The great mass of the population was strongly against the change, and 160,000 elected to be French, though only 50,000 went into actual exile, refusing to become German subjects. Since the era of the Revolution Alsace in sentiment was wholly French. To France she gave the bravest of her sons — Kellerman, Kléber and many another hero. Strasburg first heard the 'Marseillaise'; and MM. Erckmann-Chatrian, Lorrainers both, have faithfully represented their countrymen's love of *La Patrie* in the days of the second as of the first Napoleon. Of late it is claimed by the Germans that, through the emigration of the irreconcilables and the immigration of German settlers, the tendency of the old natives to accept the inevitable, and the rising up of a new generation, to whom the French connection is a tradition, the situation has slowly but steadily changed in favor of Germany and the existing firm but fair administration. The irritating passport system, a special grievance not in force elsewhere in Germany, was withdrawn in 1873. On 9 May 1902, Emperor William directed that a bill be laid before the Federal Council abolishing paragraph 10 in the imperial constitution, which imposed practically a dictatorship on the *reichsland* of Alsace-Lorraine. In December 1913, however, occurred the «Zabern» incident, in which as a result of an assault committed by an officer on a civilian cripple violent anti-Prussian riots broke out. Bitter feeling had not subsided when the war broke out. Consult Hazen, C. D., 'Alsace-Lorraine under German Rule' (New York 1917); Jordan, D. S., 'Alsace-Lorraine' (1916).

ALSBERG, älz'berg, **Carl Lucas**, American chemist, son of Meinhard Alsberg, one of the founders of the New York Chemical Society, now the American Chemical Society: b. New York city, 2 April 1877. In 1900 he was graduated from the medical college in Columbia University. For the three years following he studied physiology, pharmacology and chemistry in Germany, studying under Hofmeister and Emil Fischer. In 1902 he became head of the department of biochemistry in the Harvard Medical School. In 1908 he was appointed chemical biologist in charge of the Poisonous Plants laboratory in the Bureau of Plant Industry, at Washington. In 1912 he was nominated by President Taft to succeed Harvey W. Wiley as chief of the Bureau of Chemistry in the Department of Agriculture.

ALSEN, äl'zĕn, Germany, island of the Schleswig-Holstein province, in the Baltic, separated from the mainland by Alsen Sound at its narrowest point, 400 yards wide. Formerly a part of Denmark, Alsen was taken by the Prussians, 29 June 1864, and with a portion of the mainland joined by a drawbridge constitutes the district of Sonderburg. Sonderburg, the chief town, is strongly fortified and has a good harbor. Alsen is nearly 20 miles long with an extreme breadth of 12 miles. Area, 125 square miles; pop. 25,000.

ALSOP, ąl'sŏp, **Richard**, American poet: b. Middletown, Conn., 23 Jan. 1761; d. Flatbush, L. I., 20 Aug. 1815. He studied at Yale, but did not complete his course. He formed the literary group known as the «Hartford Wits,» which includes Benjamin Trumbull, Lemuel Hopkins and Theodore Dwight. Alsop was largely responsible for the *Echo* (1791–95), a series of travesties and burlesques on current fads and literature (pub. in book form 1807). He wrote 'Monody on the Death of Washington' (1800); the 'Enchanted Lake of the Fairy Morgana' (1808).

ALSTED, äl'stĕt, **Johann Heinrich**, German encyclopedist and theologian: b. 1588; d. 1638. His 'Cursus Philosophici Encyclopedia' (2 vols., fol., Herborn 1630), the most important complete work of its kind that had appeared, contains an interesting, and probably the earliest, article on the use and abuse of tobacco. 'Tractatus de Mille Annis' (1627) prophesied the beginning of the millennium in 1694. He also published 'Thesaurus Chronologiæ' and 'Triumphus Bibliorum Sacrorum,' attempting to prove that the Scriptures contain the principles of all arts and sciences. Alsted was professor of philosophy and theology at Herborn and later at Weissenberg.

ALSTON, Theodosia Burr. See BURR, THEODOSIA.

ALSTRÖMER, äl'strĕ-mĕr, **Jonas**, Swedish benefactor: b. 1685; d. 1761. Of humble parentage, he went to England as clerk for a Stockholm merchant, later engaged in shipbroking business independently, amassed a fortune, returned to Sweden in 1724, established woolen and other factories, introduced improved breeds of sheep, the culture of dye plants and potatoes and contributed to the formation of the

Levant and East India companies. He was ennobled and a statue to him was erected on the Stockholm exchange. His son, ALSTRÖMER, CLAS (CLAUDE): b. 1736; d. 1796; author of a work on the breeding of fine-wooled sheep, was also a distinguished botanist, a pupil and friend of Linnæus, who named after him the Alströmer or Inca Lily. This remarkable Peruvian plant Alströmer discovered at Cadiz and sent to Linnæus along with other specimens collected during his botanizing rambles over Europe.

ALTAI, al'tī, MOUNTAINS, a mountain range of central Asia, extending from the desert of Gobi in a northwesterly direction along the boundary of Mongolia and Sungaria. After passing the Russian frontier it gradually falls off in altitude and merges into the steppes. The rivers of this region are mostly head waters of the Obi and Irtysh. The mountain scenery is generally grand and interesting. The highest summit is Baluka, about 17,500 feet above the sea. The area covered by snow and glaciers is large. The mountains have a severe climate, but agriculture is carried on to some extent in the larger valleys. The inhabitants are chiefly Russians and Kalmuks.

ALTAIC LANGUAGES, a family of languages occupying a portion of northern and eastern Europe, and nearly the whole of northern and central Asia, together with some other regions, and divided into five branches, the Ugrian or Finno-Hungarian, Samoyedic, Turkic, Mongolic and Tungusic. Also called Ural-Altaic and Turanian.

ALTAMURA, äl'ta-moo'ra, Italy, city of Bari province, at the foot of the Apennines, 60 miles by rail northwest of Tarentum. Two annual fairs are largely attended and considerable trade is carried on in regional products, oil, wine, olives, grain and cattle. It is a bishop's see with a fine Romanesque 13th century cathedral and interesting archæological remains. Pop. 26,000.

ALTAR. From the Latin *alta ara,* a raised space. An elevation of any kind (earth, grass, stones, etc.) was used by the primitive races as a sacrificial spot. With the commencement of culture altar construction came into being, built of brick, stone, marble, etc. A separate altar was dedicated to each god of the Greeks, Romans and Eastern pagans. Very soon they developed into works of art according, in quality, with the best craftsmanship the period afforded, and proof of the sentiment of sacrifice felt. The ram's skull (*ægicrane*) or ox skull (*bucrane*) — signs of animal sacrifice — adorned the altar corners of the ancient Greeks and Romans, while wreaths and garlands of fruits and flowers draped the sides. These altars were erected (in the more primitive times) outdoors (on streets, squares, in meadows, near springs, on tops of mountains, etc.). Later came the altars dedicated to the household (*lares* and *penates*) within the walls of the habitations. With the advancement of art came structures of monumental form with architectural members — the plinth, capital, moldings, and even steps (degrees). These were altars devoted to burnt sacrifices. They are known as Pagan altars.

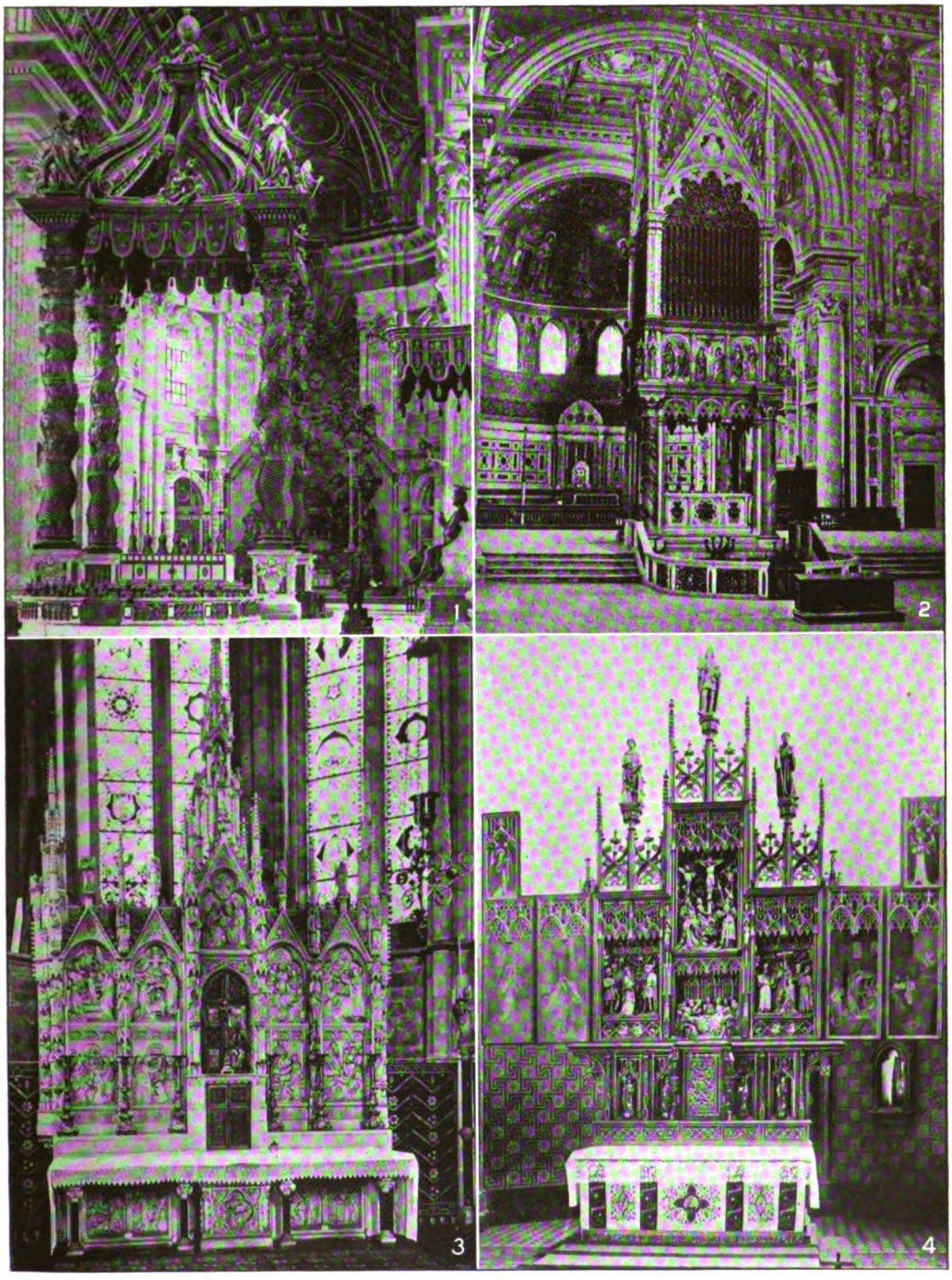
Early altars of the Jews were also erected for burnt sacrifice and were also in the open air (often on the tops of mountains), until the raising of Solomon's Temple, when an incense altar was erected *within* the Temple, the altar for burnt sacrifice being in the front court yard, open to the sky.

Christian Altars.— While the consecrated bread and wine (Flesh and Blood) are symbolic of Christ's sacrifice, the Christian altar is dedicated to the memory of the Last Supper and not to sacrificial ceremonies. Thus the primitive Church used some form of portable table which alone through the presence on its surface of the Host became sanctified. And on the withdrawal of the sacramental service the table was taken to pieces and stowed away while the Eucharist was kept devoutly screened and protected. Veritable sanctified altars of stone or wood, etc., took the place of ordinary tables for the display of the Eucharist about the 4th century, when they were built as fixed structures of stone or wood, in the early basilicas. In 517 a canon enforced the use of stone for the altar. These altars became consecrated by the presence of the body or relics of a martyr which were placed under the altar. The altar was placed immediately in front of the apsis (see BASILICA) of the basilica (always in the eastern end), where the bishops and clergy sat in a semicircle. The construction of these early stone altars consisted of a slab supported by pillars. In the open space beneath the slab reposed the body or relics of the saints enclosed in shrines. To protect the relics from dust or irreverence these curtains subsequently suggested ornamenting the altar front with an embroidered hanging, called *antependium* or *frontal* (Pugin). These antependia developed into elaborate ornamentation in precious metals, adorned with enamels and jewels; others were of delicately carved wood, painted, gilt, often embellished with crystals. Extant examples of altars of the 5th, 6th and 7th centuries are those of St. Victor in Marseilles Museum, of St. Nazaire and of St. Celsus at Ravenna, of Auriol in Provence, etc.

Up to the 9th century the altar was sanctified by the body or relic reposing beneath the altar and nothing was permitted on the altar. Even the Eucharist was suspended above the altar. From the 5th century the altar was covered with a dome (*ciborium*) supported by four columns and enclosed with hangings supported on rods. Attached to a chain or cord from the centre of the dome hung the *pyxide* holding the consecrated Host, often found in the form of a dove of gold or silver. With the 9th century the relics of the saints became exposed *on* the altar, enclosed within a shrine. Soon the relics were followed by the Book of the Four Evangels, but images were not admitted on the altar till the 9th century. The candlesticks still posed on the floor alongside the altar.

The Romanesque and Gothic periods used the massive table form of the 4th century with its slab of stone (Regensburg has an altar of this style); usually a ciborium covers these altars. Silver plastic decoration (usually from the hands of a goldsmith) soon began to be displayed in altar decoration. Perhaps most noted of the period is that of the Collegiate Church at Klosterneuenburg (Austria) by

ALTARS



1 High-Altar in St. Peter's, Rome
2 High-Altar and Ciborium in the church of St. John Lateran, Rome
3 High-Altar in Notre-Dame, Trèves
4 High-Altar in the Cathedral, München-Gladbach, Rhenish Prussia

High Altar, Roman Catholic Cathedral, St. Louis, Mo.

Nicolas de Verdun (1181) representing scenes from the Old and New Testament. From the 11th and 12th centuries the massive altars are relieved by architectural outside work — small detached columns supporting arches (effigies often in the openings) broken into trefoil and quarterfoil, tracings, mullions, etc. Gables and crockets, of course, appear. Gothic altars are frequently of carved wood, painted and gilded. Wing altars were a common form, having plastic internal ornament and painted decoration outside ('The Last Judgment' in the Church of our Lady at Danzig; the high altar in the monastery church at Blaubeuren; the 'Coronation of Mary' in the Minster of Breifach and the Bruggemann altar in the Schleswig Cathedral). In the 14th century an openwork gallery often replaces the pillars.

In Italy, in the Renaissance, a baldachino (*ciborium*) supported by four columns was in vogue, but in France this structure fell into disuse and the pyxide is then suspended from the extremity of a shaft ending in the form of a bishop's crook placed behind the altar. Behind the altar is placed a "tabernacle" (shrine) for the reliquaries. From the 13th century, in order better to display the reliquaries, chasses, etc., during fêtes, the *retable* was formed back of the altar. And the cabinet ("tabernacle") to hold the relics was placed on the retable. Then (14th century) swinging painted pictures (triptychs) were placed beneath constructed in different compartments to be opened at will. It was in the Renaissance that the great altar picture originated as a chief unit. With the early Renaissance period altars became veritable works of art. On them the greatest artists, sculptors and goldsmiths devoted their utmost talents accentuated by religious zeal.

With the growth in complexity of church edifices and their increasing separate devotional sections, other altars were installed in the additional divisions, the main altar becoming known as the high-altar, others being termed side-altars.

Portable Altars.— Termed by contemporaries variously *altaria viatica, portatilia, gestatoria,* as differentiated from the fixed or monumental church altar, these were less cumbersome pieces of priestly furniture. They consisted, as a rule, of a rectangular slab of valuable stone, as marble, agate, porphyry, onyx, amethyst, etc., enclosed in a frame of gold or gilt copper. Decorations consisted of precious stones, enamel or niello work. A wooden table usually formed the back, also richly embellished. The relic, sanctifying the altar, was enclosed in a cavity in the centre or in the corners. Beda (8th century) tells of them being used on missionary journeys; the Crusaders carried them on their campaigns in the 12th century. Some portable altars took the form of triptychs, having swinging panels that could be opened or closed at will. These consisted of ivory, precious stones or paintings. When larger relics were to be carried the altar took the form of a shrine (*chasse*), usually of sarcophagus shape resting on the claws of animals. Of existing examples we might mention a Romanesque portable altar in the Church of the Virgin at Treves — the traveling altar of St. Willibrod. One is in the treasury of the cathedral at Bamberg, one in the cathedral at Paderborn, two in the chapterhouse of Melk, several in the Cologne archiepiscopal museum, in the royal treasury chamber at Hanover, several in the new museum, Berlin. A small Gothic wing-altar is in the sacristy at Kirchlinde, Westphalia, another (14th century) in the Admont Collegiate Church, in Steyermark; another (of 1497) in the Nuremberg Germanic Museum. The Morgan collection contains a fine Gothic (14th century) folding altar of gold, decorated with jewels and enamel.

Altar Furniture.— The consecrated altar of the early Christian days was *enshrined.* Curtains hanged from the architraves of the ciborium, or from rods between the four pillars of the baldacchino of the Renaissance, to hide the altar on all four sides (the Eastern Church developed solid walls of the *iconostasis*). In the Middle Ages the veil in front of the altar disappeared (except in Lent), but the idea of enshrining persisted, for the *frontal* hid the altar and the cloth covered its top; the *dorsals* closed the rear from view, and the *riddels,* hanging from rods at the sides, hid either end. The *reredos* more solidly replaced the *dorsal* curtain. And all persist to this day.

In primitive times altars were covered with rich tissue or precious stuff, over which one linen cloth was laid during the time of celebration. This served also as a *corporal* and was called a pall. Subsequently the corporal was a distinct linen cloth set apart specially for the purpose. The cloths used in covering the altars were designated *pallæ* (*pallium altaris*) down to a late period. Three linen cloths cover the altar, the uppermost being the largest and reaching to the floor. The upper linen cloth was termed the *fair-linen.* In the Greek Church pieces of cloth (called *Evangelists*) were (and are still) placed at the four corners of the altar. Over these four pieces was spread a linen cloth (*καταφαρκα*) because it is the figure of the white winding-sheet in which Joseph of Arimathea swathed the body of the dead Saviour. Over this cloth was placed another thinner one, which represented the Glory of the Son of God seated on the altar as on a throne. Over these four pieces of cloth and these two linen coverings was a *corporal,* which represented the figure of the death and the resurrection of Jesus Christ.

Altar coverings (since the Middle Ages) in the Roman Catholic Church are: White for Christmas, the ordaining of bishops, etc.; from 24 December till 13 January; green from 13 January to Septuagesima and in Trinity period; red for Easter and for Apostles' and Martyrs' feasts; black on Good Friday; violet on Advent and fast days.

The altar now carries: Crucifix, lights (burning wax candles) first in memory of the Last Supper held at night, but since for festivals, weddings, baptisms, etc.; flowers. See also CHALICE, CRUET, OSTENSORIUM, PATEN, PAX.

Noted Altars.— Justinian (6th century) presented a magnificent altar to the Church of St. Sophie at Constantinople encrusted with precious stones and enamels. That at St. Peter's at Rome is no less splendid. The altar in the

basilica of St. Ambrose at Milan by Wolvinius (835) is coated with silver plates of repoussé work. The oldest extant altar is that found at Auriol (5th century), near Marseilles. The earliest altar with carved antependium is in the church at Cividale (8th century). In St. Mark's Venice, is the famous reredos, "pala d'oro" (10th century); it was originally an *antependium*. In Cluny Museum is the golden antependium presented to Basle cathedral by Emperor Henri Deux. A similar arcaded panel, but of carved wood, is in the Episcopal Museum of the Minister in Westphalia (12th century). The ciborium altar of St. Apollinari in Classe, near Ravenna, is of the 9th century. The best ciborium example of early Gothic is in the Church of Our Lady in Halberstadt; Ratisbonne and Vienna have two in their cathedrals; Italy has a number of mediæval ciborium altars. A magnificent altar by Andrea Ognabene, made for the Cathedral of Pistoja (1316), is of silver work. A silver antependium (14th century) is in the Museum of St. Maria del Fiore dedicated to St. John, Baptist. A silver altar is in the baptistry of St. John, Florence, by Leonardo and other artists (14th and 15th centuries).

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CLEMENT W. COUMBE.

ALTAR LEAGUE, The Family. A world-wide company of people who have made a covenant to maintain a family altar in their home. Covenant cards are furnished free on request, and to all who enroll by signing the covenant a wall-card certificate of membership is sent without cost. It is estimated that more than 60,000 new family altars have been established and 250,000 lives are being touched and influenced every day in the home because of the league. The headquarters are at 508 Lakeside Building, Chicago.

ALTA VERAPAZ, äl'ta vā'rā-päz, one of the departments of the republic of Guatemala, Central America, lying in the region between the southern boundary of Mexico and Guatemala City. Its chief town, Cobán (q.v.), is 4,047 feet above sea-level and has between 25,000 and 30,000 inhabitants. Pop. of department (1916) 97,400.

ALTDORF, ält'dŏrf, Switzerland, town, capital of Uri canton, on the Reuss near its junction with the Schächen, two miles east of Lake Lucerne. The town's distinction is due to the legend of William Tell and the shooting of the apple from his son's head in the market place. A bronze statue erected in 1895, and a theatre opened in 1899 where Schiller's play of the Swiss patriot is produced annually, commemorate the feat. In the neighborhood are the Capuchin monastery built in 1581, the ancient castle of Attinghausen with its museum of antiquities, the Schächenthal and Burglen village where Tell was born and drowned, trying to save a child who had fallen into the Schächen torrent. Pop. 4,000.

ALTDORFER, ält'dōr-fĕr, **Albrecht,** al'breHt, German artist: b. shortly before 1480, probably in Ratisbon (Regensburg); d. there 13 Feb. 1538. One of the "Little Masters" of German art (so called because of the size of some of their works, not because of their quality). His father is supposed to have been the painter Ulrich Altdorfer. Besides his engraving, which contributes most to the artist's fame to-day, Altdorfer was renowned in his own time as an architect and painter, many of his works in the latter medium having come down to us and ensuring him a distinguished place in the German school. From 1526 until his death he was a member of the "Inner Council" of Ratisbon and held the position of municipal architect. His paintings are to be seen in the museums and private collections of Berlin, where we find, at the Royal Museum, that admirable work—'The Family of Satyrs.' Other important examples of his art in the Berlin Museum are 'Repose on the Flight into Egypt,' 'Beggary Sitting on the Train of Pride' and a 'Nativity.' Others are at Frankfurt, Augsburg, Cassel, London, a most important work being the great altar piece of the Church of Saint Florian an der Donau. His largest picture—by some considered his masterpiece—is 'Alexander at the Battle of Arbela' in the Munich Gallery. This work so captivated Napoleon that it was carried off to Paris and only restored in 1815. A title sometimes bestowed on Altdorfer, "The father of Landscape Painting," comes to him through the affection for nature which appears so

strongly in such works as 'The Mountain Landscape,' at Munich or the 'Susanna at the Bath' in the same gallery. It is most strongly evinced, however, in his engraving. In this art he appears as perhaps the only one of the German masters who engraved his own woodblocks, Dürer and the others leaving that process to skilled workmen. There is an open question as to whether Altdorfer was a pupil of Dürer's but there is no doubt of the great Nürnberger's influence on the younger man. The number of his copper-engravings is generally placed at 109 (including etchings), his woodcuts at 65 — among the latter the 'Madonna of Ratisbon' should be cited. But it is the etchings such as the 'St. Jerome,' 'Samson and Delilah' and the 'Venus' which stand the highest in Altdorfer's work, and in them we get to the full the flavor of his art — precise in its mastery of the material but with a genuinely Romantic tendency in the thought about the pine trees, the rocks and the ruins amongst which he grouped his figures from the sacred history. Albrecht's brother ERHARD ALTDORFER (or ALTDORFFER), active between 1512 and 1561, was also an architect, painter and engraver, attaining distinction in all three branches. Consult Voss, 'Meister der Graphik,' (Leipzig 1910).

ALTENA, ăl.tă'nạ, Germany, a town of Westphalia, Prussia, on the Lenne, 18 miles southwest of Arnsberg, capital of the district. It has long established manufactures of iron, steel, copper, brass and nickel goods, especially of altar vessels. In the vicinity is the ancient castle of the counts of La Marck, related on the female side to the Hohenzollerns. Pop. 15,000.

ALTENBURG, ăl'tĕn-bûrk Germany, town, capital of Saxe-Altenburg duchy, on the river Pleisse, 24 miles by rail south of Leipzig. Altenburg manufactures cigars, gloves, brushes, hats and haberdashery and has an important book trade, and traffic in grain, horses and cattle. An historic castle with its fine picture gallery, a cathedral, public library, museum of antiquities, etc., are among the principal buildings. Altenburg was for some time an imperial city and was almost destroyed by the Hussites in 1430. In 1455 the young Saxon princes Albert and Ernest were abducted from the castle. Pop. 40,000.

ALTENSTEIN, ăl'tĕn-stīn, Germany, a mountain castle in Saxe-Meiningen duchy, on the southern slope of the Thuringian forest, near the Liebenstein tourist resort, 12 miles southeast of Eisenach. The summer residence of the reigning dukes, it has great historic and scenic interest. Here in the 8th century resided Boniface, the English apostle to the Germans, and here in 1521 Luther was secreted from his enemies by Elector Frederick the Wise. In 1799 a cave which is entered through a subterranean gallery, was discovered in the castle park over 600 feet long; through its whole extent flows a rapid stream sufficiently deep to bear barges and turn a mill at the place where it issues from the earth.

ALTERATION, such a change in a written instrument or property interest as, if effective, would result in a different instrument or interest from the original. The alteration of a written instrument is effected by any material change in its language or character, such as adding terms, erasing or interlining or removing a seal from a deed. The law distinguishes in cases according as the alteration is made by a party or by a stranger. See CONTRACT; DEED; NEGOTIABLE INSTRUMENT.

ALTERATIVE, a remedy that acts slowly and in an unknown manner, probably by promoting metabolism. Alteratives are administered in small doses, and for a considerable length of time. Mercury is a powerful alterative, and has been proved very effective in cases of syphilis. Arsenic and its compounds are employed in certain skin diseases. Cod liver oil is employed in diseases associated with malnutrition, including tuberculosis and rickets.

ALTERNATE, in American politics, a delegate chosen to act in the place of the regular delegate to a convention during the latter's absence. At all political conventions since 1840 alternates in increasing numbers have been selected to attend when their principals did not get to the convention at all, or to take the latters' places during a temporary absence. Since 1884 in all conventions of the Republican party an alternate for every delegate has been chosen. Alternates are usually seated in a separate part of the convention hall; and when a regular delegate withdraws, his alternate has a right to the seat of his principal and to act in his stead. Recent rulings by convention chairmen hold that, on roll call, if a member answer "present but not voting," he is constructively absent and the chairman may call on the alternate to vote in his stead.

In American political law the general principle is that a person elected to office must himself discharge the duties of that office. There can be no written proxies either for legislators or executive officials. In some States a lieutenant-governor may act as governor whenever the governor is absent from the State and some city charters permit a mayor to designate an acting mayor from among certain officials when he expects to be absent. In New York city the president of the board of Aldermen becomes automatically acting mayor when the mayor is absent from the city. Concerning the judiciary, there exists a certain latitude in assignment of justices, by which a justice may hold court outside his own district. This applies to both Federal and State courts. See CONVENTION; PARLIAMENTARY LAW.

ALTERNATING CURRENT. See ELECTRICAL TERMS.

ALTERNATION OF GENERATIONS. The term, alternation of generations, is applied to the alternation of sexual and asexual individuals in the life history of a plant; e. g., in the fern, a small sexual plant, called the prothallium, which most people never see, bears the eggs and the sperms. A sperm fertilizes an egg, which then develops into the familiar fern plant. The fern plant produces spores, which in turn develop into prothallia, so that the fern plant produces the prothallium and the prothallium produces the fern plant, the two phases, or generations alternating regularly.

Alternation of generations, in a form most easily understood, is seen in the true ferns. The principal features of the life history of a common fern will make the subject clear

FIG. 1,— *A*, prothallium of fern; *B*, fern plant.

(Fig. 2). A spore from the fern plant, falling on moist ground or rotten wood, germinates and develops into the prothallium, a thin, flat, prostrate body, which seldom reaches more than a quarter of an inch in length or more than one-thirty-second of an inch in thickness. It is green and therefore independent (Fig. 2, *A*). Upon the under side of the prothallium the eggs and sperms are developed, the eggs being developed singly in organs called archegonia, while the sperms are developed in considerable numbers in organs called antheridia. A vertical section of a portion of a prothallium showing an archegonium containing one egg and an antheridium containing several sperms is shown in Fig. 2, *B*. Since the prothallium produces eggs and sperms, which are commonly called gametes, it has been named the *gametophyte* (q. v.). The sperm escapes from the antheridium, enters the archegonium and unites with the egg. This egg, thus fertilized, is the first cell of the fern plant which ultimately produces spores and is therefore called the *sporophyte*. After fertilization, the egg divides rapidly, forming a more or less spherical mass of cells (Fig. 2, *C*). It then breaks out from the archegonium and becomes erect (Fig. 2, *D*). The first leaves are small and simple, but the little plant develops roots and larger leaves, while the prothallium disintegrates and soon disappears completely, so that the sporophyte, now fully independent, is the only phase remaining. As the leaves approach maturity, *sori*, or "fruit dots," easily visible to the naked eye, appear upon the under surface (Fig. 2, *E*, *f*). A vertical section of a sorus is shown in Fig. 2, *F*. In this case, the sorus is covered by an umbrella-like *indusium*, underneath which are the essential structures, the *sporangia*. Within the sporangium, the shift from the sporophyte generation to the gametophyte generation takes place. As the sporangium approaches maturity, *spore mother cells* are formed (Fig. 2, *G*) each of which by two characteristic divisions called the reduction divisions gives rise to four spores (Fig. 2 *H*). The spore is the first cell of the gametophyte generation. Upon germination, it develops into the prothallium. Thus the fertilized egg, produced by the prothallium, develops into the fern plant and the spore produced by the fern plant develops into the prothallium. This regular alternation of prothallium and fern plant illustrates alternation of generations in its most easily understood form. The nuclei, during division, show a feature of great importance; the nuclei of the sporophyte have twice as many chromosomes as those of the gametophyte (See CELL and CHROMOSOMES). The number of chromosomes is doubled when the sperm and the egg nuclei fuse at fertilization, and during the two divisions by which four spores are formed from a spore mother cell in the sporangium, the number of chromosomes is reduced one-half, so that the gametophyte number is restored. This "x" and "2x" condition of chromosomes is characteristic of the two generations in all plants which have reached the level of sexuality.

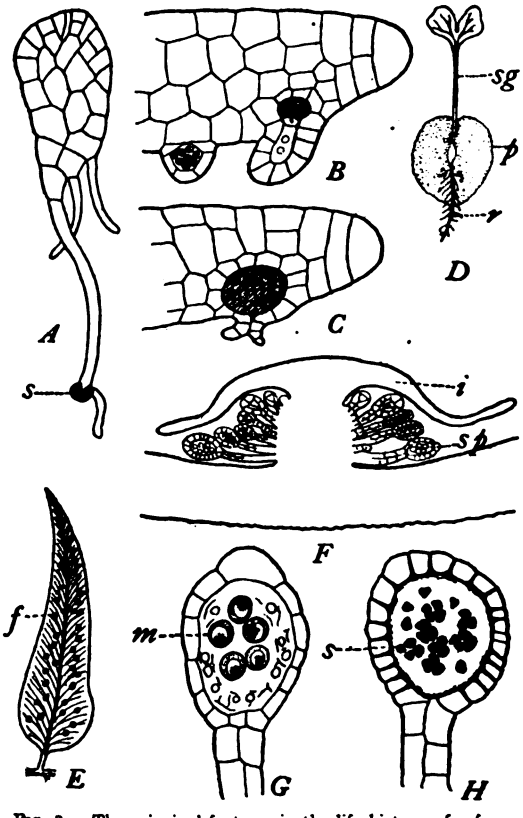

FIG. 2.— The principal features in the life history of a fern. *A*, young prothallium (gametophyte) developing from the spore, *s*; *B*, vertical section of the tip of older prothallium showing an archegonium with one egg (shaded), and an antheridium showing eight of the numerous sperms; *C*, later stage showing the young sporophyte (shaded) developing from the fertilized egg; *D*, the prothallium, or gametophyte, *p*, with young sporeling (sporophyte) *sg*; *r*, root; *E*, leaflet of mature plant bearing numerous fruit dots or sori, *f*; *F*, section of single sorus showing numerous sporangia, *sp*, under the umbrella-like indusium, *i*; *G*, section of young sporangium showing five of the sixteen spore mother cells, *m*; *H*, later stage showing spores, *s*, developed from the spore mother cells.

Alternation of generations is just as definitely present in plants above and below the

ferns, but it is not so easily recognized, because the gametophyte, in the higher plants, becomes parasitic upon the sporophyte, while in the mosses and liverworts the sporophyte is parasitic upon the gametophyte, not yet having attained the independent condition illustrated by the ferns.

In the higher plants, as the gametophyte became dependent upon the sporophyte and even became included within the tissues of the sporophyte, it became more and more reduced until it lost all resemblance to an independent gametophyte and is recognizable as such only by the evidence of comparative morphology. A complete series of forms illustrating the gradual reduction of the gametophyte would require pages of description and illustration, but a pine and a sunflower will indicate the general trend of the reduction. The pine tree and the sunflower plant are sporophytes. The pine (also the fir, spruce, hemlock, etc.) bears two kinds

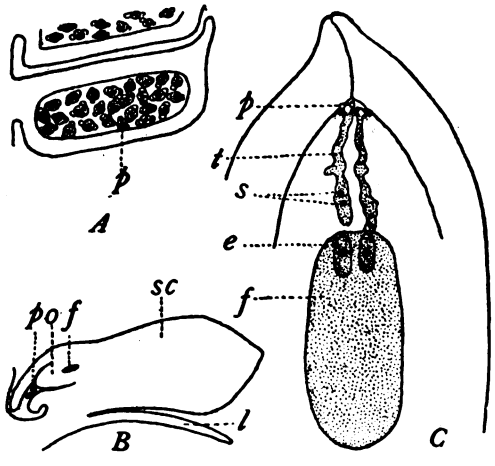

FIG. 3.— Some important features in the life history of the pine. *A*, part of a longitudinal section of a male cone showing one sporangium and part of another, containing pollen grains, *p*; *B*, part of a longitudinal section of a young female cone showing a reduced leaf, *l*, bearing a large scale, *sc*, which bears a sporangium, *o*, containing a megaspore, *f*; *p*, pollen grains; *C*, longitudinal section of sporangium (ovule) at a later stage; *p*, pollen grains; *t*, pollen tube containing two sperms, *s*; *f*, female gametophyte showing two of the eggs, *e*.

of cones, a rather small one producing an abundance of pollen and a comparatively large one producing seeds. The small cone, called the male cone or the staminate cone, consists of an axis with a large number of very small and much modified leaves, each bearing on its under surface two sporangia which are equivalents of the sporangia of the ferns. The sporangium contains several spore mother cells, each of which produces four spores, called microspores or pollen grains. The microspore is the first cell of the male gametophyte. The larger cone, called the female or ovulate cone, consists of an axis bearing much reduced leaves, in the axil of each of which is a "scale" with two sporangia or ovules. Within the sporangium one spore mother cell appears and divides into four spores, called megaspores, three of which disintegrate while the other germinates within the tissue of the sporangium, forming a prothallium or female gametophyte, consisting of a mass of rather uniform cells, and later producing four or five eggs. The megaspore is the first cell of the female gametophyte. The pollen grain is carried by the wind to the female cone where it falls upon the sporangium and germinates, forming a *pollen tube* which grows down through the tissue of the sporangium until it reaches the egg. Two sperms are formed within the pollen tube and one of these enters the egg and fertilizes it. As in the fern the fertilized egg is the first cell of the sporophyte generation. The egg divides rapidly and becomes differentiated into root and stem regions, while the tissues of the sporangium and surrounding structures become hardened into a seed coat. The seed then falls out from the cone and develops into the pine tree. In comparing this life history with that of the fern, it will be noted that in the fern there is only one kind of sporangium producing one kind of spore which gives rise to a gametophyte bearing eggs and sperms, while in the pine there are two kinds of sporangia, one producing spores which give rise to male gametophytes and the other producing spores which give rise to the female gametophytes. Plants with only one kind of spores are *homosporous*. Those with two kinds of spores are *heterosporous*. This condition is derived from the homosporous and is found in all seed plants and in some ferns and lycopods.

In the sunflower the reduction of the gametophyte is still more extreme. The sunflower is composed of hundreds of very small flowers, each of which has five stamens and one ovary. The stamen bears four sporangia, each containing hundreds of microspores or pollen grains. The ovary contains one sporangium within which one spore mother cell produces four megaspores, one of which germinates, while the others abort. The prothallium formed by the germination of this spore is entirely included within the sporangium and is completely dependent. It is called the *embryo-sac* and contains only eight nuclei, which at first lie free in the sac. Later, three of these in the narrower end of the sac become separated by walls. These three are called *antipodal cells* and, usually, they have no function. Two of the nuclei, called *polar nuclei*, fuse and form a large nucleus called the *endosperm nucleus*. The other three form a group at the opposite end of the sac from the antipodals and constitute the *egg apparatus*. They become organized as more or less definite cells, but are surrounded only by a delicate pellicle. One of the three is the egg; the other two are called *synergids*, because they are supposed to assist in fertilization. The pollen grain is carried to the tip of the ovary by insects and there produces a long pollen tube containing two sperm nuclei. One of these nuclei fuses with the endosperm nucleus which then divides and produces a tissue called the *endosperm*, constituting the principal bulk of corn, cereals and other seeds. The other sperm nucleus fuses with the egg, which, as in the other cases already considered, is the first cell of the sporophyte generation. From the fertilized egg a new sunflower plant is produced. The gametophyte generation consists of two separate plants, the male and the female. The male, composed of

the pollen grain and its tube, and the female, consisting of the embryo-sac, alternate with the sporophyte generation, the sunflower plant, which begins with the fertilized egg. Some features of the life history of the sunflower are shown in Fig. 4.

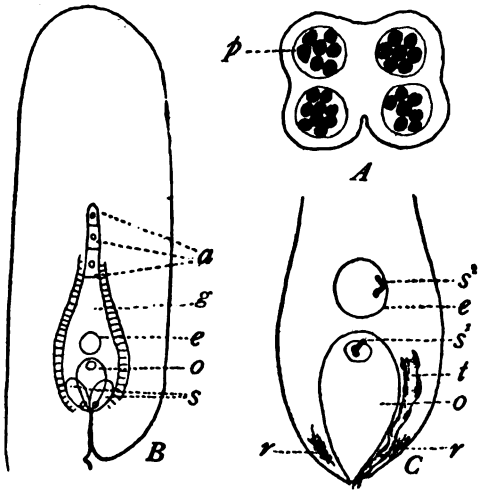

FIG. 4.— *A*, transverse section of anther with four sporangia, each containing spores (pollen grains); *B*, sectional view of sporangium (ovule) containing the embryo-sac (g); antipodal cells (a); endosperm nucleus (e); synergids(s); egg (*o*); *C*, upper end of embryo-sac at time of fertilization; *t*, pollen tube which has discharged its sperms; *r*, remains of synergids; *o*, egg; one sperm s^1 is fusing with the nucleus of egg and the other sperm, s^2, is fusing with the endosperm nucleus, *e*.

Below the ferns, in the mosses and liverworts, the gametophyte and sporophyte generations alternate just as regularly, the fertilized egg being the first cell of the sporophyte and the spore produced by the sporophyte being the first cell of the gametophyte; but the sporophyte never becomes free from the gametophyte and, consequently, the existence of two generations is not so evident as in the ferns. The spore produces a branching filament called the protonema, upon which buds appear and develop into the familiar leafy moss plants. Upon the leafy plant, often at the top, antheridia and archegonia appear, containing respectively the sperms and eggs. The whole structure from the spore up to this point constitutes the gametophyte. A sperm fertilizes an egg which then develops into a stalk bearing a sporangium, called a capsule, within which spore mother cells appear, each giving rise to four spores, the spore being the first cell of a new gametophyte generation. The sporophyte begins with the fertilized egg and ends with the spore mother cell.

It will be noted that the two generations are more nearly equal than in the fern.

In the liverworts, the life history is essentially the same, but the protonema is inconspicuous or entirely lacking. The sporophyte is not so highly developed as in the moss, and, in the lower liverworts, the sporophyte is entirely included within the gametophyte. But here again the sporophyte begins with the fertilized egg and the gametophyte begins with the spore.

In plants below the liverworts, i. e., in the algæ and fungi, alternation of generations is easily recognized in many cases. In forms which have not reached the level of sexuality there is no alternation, but with the origin of sex, i. e., with the fusion of gametes, the sporophyte had its beginning. In many of these simple plants reduction of chromosomes occurs immediately after the fusion of gametes without the formation of any spores, no recognizable body being built up which could be called a sporophyte. As the interval between the fusion of gametes and the reduction of chromosomes became more prolonged, a recognizable body was formed, which in some cases looked like the gametophyte and in some cases looked different. When this body produces spore mother cells, each of which gives rise to four spores, practically all botanists admit that there is an alternation of generations. It must be admitted that the term sporophyte is a misnomer in those simple forms which do not produce spores, but the fundamental feature is this, that the fusion of gametes initiates a generation — long or short — which comes to a close with the reduction of chromosomes. Consequently, we should insist that the two generations are marked by the number of chromosomes, the sporophyte having twice as many as the gametophyte.

The sporophyte, at its beginning, is small and, in many cases, dependent upon the gametophyte; but higher in the scale it becomes independent and is the generation which we recognize as the plant. On the other hand the gametophyte in the early forms is the dominant generation which, higher in the scale, becomes dependent, and then more and more reduced until it can be seen only with the aid of the miscroscope. Here it is the sporophyte which we recognize as the plant. This evolution of the sporophyte and reduction of the

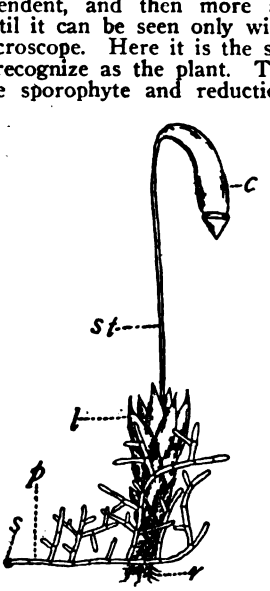

FIG. 5.—*s*, spore; *p*, protonema; *l*, leafy plant; *st*, stalk; *c*, capsule *r*, rhizoids.

gametophyte are among the most interesting phenomena of plants.

We believe that in animals, as well as in plants, there are two alternating generations, characterized by the number of chromosomes, but this belief is shared by only a few botanists

and, as far as we know, practically all zoologists oppose it.

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CHARLES J. CHAMBERLAIN,
Professor of Morphology and Cytology, University of Chicago.

ALTGELD, ält'gĕld, **John Peter,** American politician: b. Germany, Dec. 1847; d. 12 March 1902. Brought to Mansfield, Ohio, in infancy, he received a public-school education; served in the Civil War as a private in the Union army, 1864–65; taught school in Missouri; became a lawyer there and county attorney of Andrew County in 1874. Removing to Chicago in 1875 he became prominent in the Democratic party. An unsuccessful candidate for Congress in 1884, he was judge of the Chicago Superior Court 1886–91. Elected governor in 1892, one of his first official acts was to pardon three anarchists, imprisoned since 1887 (two for life and one for 15 years) for complicity in the bomb-throwing which killed seven policemen in Chicago, 4 May 1886 (See ANARCHISM; HAYMARKET MASSACRE). It should be said that many leading United States citizens had petitioned for their release on the ground of insufficient evidence, an assumption which Judge Gary (q.v.) has vigorously repelled. Altgeld was governor till 1897. He was a prominent champion of free silver and an active supporter of Bryan for the Presidency in 1896 and 1900, and was defeated as independent candidate for mayor, 1899. He was an able speaker, an efficient advocate of prison reform, and appears to have been moved chiefly by sympathy with the working class. He wrote: 'Our Penal Machinery and Its Victims,' 'Live Questions,' etc.

ALTHÆA. See HOLLYHOCK; MARSH MALLOW.

ALTHORP, Lord. See SPENCER.

ALTHUSIUS, Johannes, German philosopher: b. 1557; d. 1638. He was for many years professor of ethics and law at Herborn. He wrote the first treatise on politics ever produced in Germany. His system claimed that social life was based on a contract express or implied between men; he was thus the forerunner of Rousseau. He claimed that all rights proceed from the people and was quite outspoken against any usurpation of those rights. He included workingmen's unions or combinations among monopolies requiring regulation. He wrote 'Politicia Methodice Digesta' (Herborn 1603); 'Jurisprudentiæ Romanæ Libri' (ib., 1588); 'Dicæologicæ Libri tres Totum et Universum Jus, quo Utimur, Methodice Complectantes' (ib., 1617). Consult Gierke, Otto, 'Johannes Althusius' (Breslau 1880).

ALTIMETRY, the art of ascertaining altitudes geometrically by means of a quadrant, sextant, or theodolite. The instrument so used is then known as an altimeter.

ALTISCOPE, an instrument consisting of an arrangement of mirrors in a vertical framework, by means of which a person is enabled to overlook an object (a parapet, for instance) intervening between himself and whatever he desires to see, the picture of the latter being reflected from a higher to a lower mirror, where it is seen by the observer.

ALTITUDE, in mathematics, denotes the perpendicular height of the vertex of any plane or solid body above the line or plane of its base; thus the altitude of a triangle is measured by a perpendicular let fall from any one of its angles upon the base, or upon the base produced; therefore the same triangle may have different altitudes, accordingly as we assume one side or another for its base. Again, the altitude of a cone or pyramid, whether right or oblique, is measured by a perpendicular let fall from the vertex to the plane of its base. Similar remarks apply to other solids. In astronomy altitudes are measured or estimated by the angles subtended between the object and the plane of the horizon; and this altitude may be either true or apparent. The apparent altitude is that which is obtained immediately from observation; and the true altitude that which results from correcting the apparent altitude, by making allowance for parallax, refraction, etc. The altitude of a terrestrial object is the height of its vertex above some horizontal plane assumed as a base.

ALTITUDE AND AZIMUTH INSTRUMENT. Altitude, in astronomy, is the height of a heavenly body above the horizon, and is measured, not by linear distance, but by the angle which a line drawn from the eye to the heavenly body makes with the horizontal line, or by the arc of a vertical circle intercepted between the body and the horizon. The azimuth of a heavenly body is the angle measured along the horizon between the north or south point and the point where a circle, passing through the zenith and the body, cuts the horizon. An altitude and azimuth instrument consists essentially of a vertical circle with its telescope so arranged as to be capable of being turned round horizontally to any point of the compass. It thus differs from a transit instrument, which is fixed in the meridian. To take an *altitude* the telescope is directed toward the body to be observed, and the angle which it makes with the horizon is read off the graduated circle. The altitude thus observed must receive various corrections — the chief being for parallax and refraction — in order to get the true altitude. The azimuth — derived from an Arabic word signifying "a quarter of the heavens," — is usually measured westward from the point most remote from the elevated pole, beginning at 0° and returning to it at 36°. Thus, in northern latitudes, where the north pole is elevated, the azimuth is measured from the south point, so that the east point, for instance, has an azimuth of 270°.

ALTON, ăl'tŏn, Ill., city in Madison County, on the Mississippi River and on the Chicago & Alton, Cleveland, Cin., C. & St. L., C., B. & Q., C., P. & St. L., Illinois Terminal and Missouri & Illinois Bridge & Belt railroads, about seven miles above the mouth of the Missouri River and 25 miles north of St. Louis. Alton was settled early in the century, but was not in-

corporated as a city until 1837. The city, built upon a high limestone bluff, has very picturesque surroundings. Seat of Shurtleff College, Monticello Seminary and Western Military Academy. Has 14 public and three parochial schools. Churches of all denominations. Alton has considerable river trade and is a distributing point for farm products. Large manufacturing district producing bottles, pig lead, strawboard, castings, tools, cartridges, stokers, mine cars, brick, sewer pipe, oil products, powder, flour, meat products, stone and sand. Annual value of manufactured products, $40,000,000. The city is governed by a mayor and common council, elected every two years by the people. There are two national and three savings banks and two daily newspapers. In 1837 Elijah P. Lovejoy, the abolitionist, was murdered here. A monument to his memory was erected in 1897. Pop. (1915) 25,000; including suburbs, 30,000.

ALTON LOCKE, a story by Charles Kingsley, published in 1850. It was his first novel, and displayed the author's broad sympathy for the condition of the English working classes. It excited immediate attention, and was an important factor in arousing the upper classes to a realization of their responsibilities toward the less fortunate. The altruism of Locke and his friends, Crossthwaite, Mackaye, Lady Ellerton and Eleanor, forms an admirable and inspiring feature of the book.

ALTONA, ăl'tō-na, Germany, a town in the Prussian province of Schleswig-Holstein, on the Elbe, immediately west of Hamburg. It has spacious squares and streets, which are embellished by several monuments, notably the memorials of the wars of 1864 and 1870. There are fine municipal and judicial buildings, a theatre, a gymnasium, technical schools, a school of navigation and a hospital. It has manufactures of tobacco and cigars, of machinery, woolens, cottons and chemicals. There are also extensive breweries, tanneries and soap and oil works. It has an extensive maritime trade, but its neighbor, Hamburg, is easily its commercial superior. Pop. 168,301.

ALTOONA, ăl-too'na, Pa., city in Blair County, on the Pennsylvania Railroad, 118 miles east of Pittsburg. It has an elevation of 1,182 feet above the sea; situated in the midst of a most picturesque mountain region, at the eastern base of the Alleghany Mountains. For many years Altoona has been regarded as the most typical of American railroad towns, for here are located the immense machine shops of the Pennsylvania Railroad, the largest railroad shops in the world, where over 17,000 workmen are engaged in manufacturing and repairing locomotives, passenger coaches and freight cars. The normal output from the shops is five engines a week. There are also silk mills, planing mills, a bar iron plant, brick and tile works and other important manufactories of machinery, agricultural implements, etc. According to 1917 estimate of manufactures there were in that year 70 establishments of factory grade employing 19,165 persons, of whom 16,971 were wage earners, receiving a total of $20,301,165 in wages and salaries. Altoona is centrally situated in a bituminous coal region and is also the business centre of a considerable agricultural region. The city has an excellent school system, a fine high school and many private schools. Among its 52 churches are many handsome buildings. It has three banks and three trust companies with a combined capital of over $1,000,000; a public library building and several hospitals. The famous Horseshoe Bend, on the line of the Pennsylvania Railroad, is located near the city, and Lakemont Park is a well-known pleasure ground in Logan township. The city owns the water-works plant, which was acquired in 1872 at a cost of $680,000, and upon which $97,000 is expended annually. The city's expenses aggregate $565,000 yearly, of which amount about $280,000 is expended for schools, $50,000 for the police department and $20,000 for municipal lighting. The city was founded in 1850 by the Pennsylvania Railroad Company. It was first incorporated as a borough in 1854, and chartered as a city in 1868. The commission form of government was adopted in 1914. During the great railroad strike of 1877 Altoona was the centre of the disturbed section and troops were ordered out to protect railroad property here. It is a growing, thriving city. There are three daily and numerous weekly newspapers. Pop. (1910) 52,127; (1916) 60,000.

ALTOONA, or **ALLATOONA PASS,** a mountain pass in northern Georgia, the scene of a sharp engagement between the Federal troops under General Corse and the Confederates commanded by General French, on 5 Oct. 1864. The losses on each side were about equal.

ALTO-RELIEVO, ăl'tō-rĕ-lyā'vō (Ital. "high relief"), the term applied to sculpture that projects from the plane to which it is attached to the extent of more than one-half the outline of the principal figures.

ALTRICES, birds that are hatched from the egg before they have acquired feathers or the ability to care for themselves. Hence they must remain in a nest and be protected and fed by the parents. This division, also called *Nidicolæ,* includes all birds except those known as game-birds and seafowl.

ALTRINCHAM, ăl'trĭng-ăm, or **ALTRINGHAM** (and so pronounced), England, a town in Cheshire, eight miles southwest of Manchester. Many residences are occupied by those whose business is in Manchester, who are attracted by the healthful climate and the vicinity of Bowdon Downs and Dunham Massey Woods. Market gardening is carried on, large quantities of fruit and flowers being grown for sale in Manchester. Cabinet-making is also practised, and there are saw-mills, iron foundries and manufactures of cotton, yarn and worsted. Pop. 16,831.

ALTRUISM, a term in psychology and ethics to denote disposition and conduct directed toward the well-being of others. It is contrasted with egoism, or self-seeking disposition and conduct. It is essential to altruism, as well as to egoism, that the good of others, or of self, should be consciously and intentionally pursued. Actions and dispositions which are instinctive, such as maternal instinct, are not, properly speaking, altruistic, nor are the opposite egoistic. It is only when the consciousness of self is sufficiently developed in the child to give rise to a contrast between self

and the "other" (*alter*), that the conscious pursuit of the interest of one of them is possible. This is covered by psychologists by saying that real altruism and egoism are always "reflective." Altruism is also applied to the type of ethical theory which bases morality upon generous or altruistic disposition or conduct (in the sense defined above).

ALTSHELER, ălt'shā-lėr, **Joseph Alexander,** American author and journalist: b. Three Springs, Ky., 29 April 1862. He studied at Vanderbilt University and has been connected with the Louisville *Courier-Journal* and the New York *World*. His numerous novels are chiefly on American historical subjects and among them are 'The Sun of Saratoga' (1897); 'A Soldier of Manhattan' (1897); 'The Last Rebel' (1899); 'In Hostile Red'' (1900); 'In Circling Camps' (1900); 'My Captive' (1902); 'The Wilderness Road' (1901); 'The Candidate' (1905); 'The Forest of Swords' (1915); 'The Hosts of the Air' (1915); 'The Guns of Europe' (1915).

ALTUS, Okla., city and county-seat of Jackson County, 145 miles southwest of Oklahoma, on the Saint Louis and San Francisco, the Kansas City, Mexico and Orient and other railroads. It contains flour, oil and alfalfa mills. Stock raising and truck farming are important industries of the surrounding district. The city owns the electric plant and the waterworks. Pop. 5,200.

ALTWASSER, ält'väs-ĕr, Germany, town in Silesia, 43 miles southwest of Breslau. It has factories for glass, porcelain, machinery, cotton-spinning, iron foundries and coal mines. Pop. (1910) 12,144.

ALUM, in chemistry, a general name for a large class of substances, which may be defined as double sulphates or selenates, in which one of the bases is aluminum, chromium, manganese, iron, indium or gallium, and the other is sodium, potassium, rubidium, cæsium, ammonium, silver or thallium. The alums all crystallize in cubes or octahedra, with 24 molecules of water, and are all isomorphous, so that when in solution together they cannot be separated by crystallization. In naming them aluminum is understood to be one of the metals present unless the contrary is expressly indicated. Thus "potash alum" is the alum whose formula is $Al_2(SO_4)_3 + K_2SO_4 + 24H_2O$. If aluminum is not present, the metal that replaces it is stated; thus "iron-sodium alum" is the alum whose formula is $Fe_2(SO_4)_3 + Na_2SO_4 + 24H_2O$. When selenium replaces the sulphur in one or both of its positions, the alum is most clearly identified by giving its formula. In addition to the true alums a class of substances known as "pseudo-alums" exists. These also crystallize with 24 molecules of water, but they are not isomorphous with the true alums. $Mn_2(SO_4)_3 + MgSO_4 + 24H_2O$ is an example of this class.

All the alums are soluble in water, and it is probable that all are resolved, at least partially, into their constituents, by solution. It is known that in certain cases (in silver alum, for example) the separation is absolute. All of the alums give an acid reaction when in solution, all have an astringent taste and all lose their water of crystallization when heated.

The alum of commerce is assumed to be potash alum, the formula of which has been already given. Ammonia alum — $(NH_4)SO_4Al_2O_3(SO_3)_224H_2O$ — is sometimes substituted, however, owing to the cheapness of sulphate of ammonia, which is now obtained as a by-product in the manufacture of illuminating gas. Sodium alum is probably not substituted for potash alum to any great extent.

The alums are largely used in the arts, especially in dyeing and tanning, and in the purification of water. Potassium alum is also used with borax in waterproofing cloth and with lime in preserving timber; in the size used in paper making; and as a soap precipitant in the manufacture of glycerine. Bread made from flour containing a small amount of alum is said to be very white, and partly for this reason and partly on account of the cheapness of the substance, ammonia alum has been largely used in the manufacture of baking-powders. This practice has been condemned and pronounced detrimental to health, however, by nearly all the authorities who have written on the subject.

Commercial alum is made from alum stone (see ALUNITE), from alum shale, or from bauxite and cryolite, generally by roasting. It is also made in greater purity by mixing solutions of the sulphates of alumina and potassa and allowing the alum to crystallize out. In making ammonia alum, sulphate of ammonia is substituted for the potassium sulphate (see ALUNITE). Some alums occur native. (See MENDOZITE; TSCHERMIGITE.) The United State census of 1914 reported 19 establishments making alums, with a total output of 313,712,000 pounds, valued at $3,467,969, an increase over 1909 of 37,418,000 pounds, and $445,614. Of the 19 establishments, 5 were located in Pennsylvania, 3 each in Illinois, Massachusetts and New York, 2 in Michigan and 1 each in California, Connecticut and New Jersey. The output comprised 142,438,000 pounds reported as aluminum sulphate, valued at $1,277,836; 23,338,000 pounds of alum cake, valued at $251,186; 42,562,000 pounds of concentrated alum, valued at $450,730; 22,629,000 pounds of burnt alum, valued at $364,656; 12,765,000 pounds of potash alum, valued at $219,968; 13,995,000 pounds of soda alum, valued at $254,477, and 55,985,000 pounds of other alums, designated as porous alum, excelsior alum, pearl alum, ammonium alum and chloride of alumina, valued at $649,116.

Alum Poisoning.— This poisoning may be acute or chronic, the latter being much more common. In the acute variety, often the result of accidental drinking of a gargling solution, the symptoms are nausea, vomiting, purging, cold clammy skin, small thready pulse, thirst, muscular tremor, followed by a rise in temperature in those that have recovered. The treatment pursued in the case of alum poisoning is to wash out the stomach and use the white of eggs as a chemical antidote.

Alum being so widely employed as a preservative, as a means of clarifying water and as an adulterant in baking-powders, the question of chronic alum poisoning becomes of great importance. The symptoms that have been most frequently observed in such poisoning are disturbances of digestion and constipation. The question as to its harmful action

on the kidneys is not yet decided, but it would seem to be harmful rather than the reverse.

ALUMBAGH, a domain in India formerly belonging to one of the princes of Oudh, about four miles south of Lucknow, near the road to Cawnpore. It comprised a beautiful palace, a mosque, a temple and other buildings surrounded by a garden, all in the centre of a magnificent park enclosed by a lofty wall with turrets at each angle. On the outbreak of the Indian mutiny this place was occupied by the revolted Sepoys and converted into a fort. On 23 Sept. 1857 it was captured by the British, then on their way to relieve Lucknow. Leaving a garrison of 300 European troops, together with the sick and wounded and about 4,000 native camp-followers, the main body, under Outram, Havelock and Neil, pushed on to Lucknow. These generals were unable to send reinforcements, but at the end of November the place was relieved by Sir Colin Campbell. The latter left Sir James Outram, with a force of 3,500 men, to hold the Alumbagh, a task which he successfully accomplished, though repeatedly attacked by overwhelming numbers of the rebels. In March 1858 the garrison was finally relieved. At the foot of a tree within the grounds Sir Henry Havelock was buried.

ALUMINA (Al_2O_3), the only oxide of the metal aluminum. As found native, crystallized, it is only second to the diamond in hardness. The transparent varieties are the sapphire and ruby, the opaque are corundum and emery, only the corundum being pure. In combination with silica it is one of the most widely distributed of substances, ranking in this respect next to oxygen and silicon. It enters in large quantity into the composition of granites, traps, slates, schists, clays, loams and other rocks. The hydrated oxide, $Al_2O_3.H_2O$, occurs as disapore, and with ferric oxide as bauxite. Various aluminates occur in certain gems, as in spinel and chrysoberyl. Alumina may be obtained by adding a solution of ammonium hydrate to purify alum dissolved in 20 parts of water, thoroughly washing the very gelatinous precipitate formed, and then drying it carefully. It may also be prepared by igniting powdered aluminum in air or oxygen. Alumina is a white powder, without taste or smell, and infusible except in the oxyhydrogen flame. It is the basis of porcelain, pottery, bricks and crucibles; and it has a strong affinity for oil and coloring matter, which causes it to be employed in the state of clays as a cleansing powder, and in a state of purity in the preparation of the colors called lakes, in dyeing and calico-printing. It combines with the acids, and forms numerous salts, the most important of which are the sulphate (see ALUM) and the acetate. The latter salt is formed by digesting strong acetic acid (vinegar) with the newly precipitated earth; but for the use of the manufacturer, by decomposing alum with acetate of lead (sugar of lead), or more economically with acetate of lime, a gallon of which, of the specific gravity, 1.050, is employed for every 2¾ pounds of alum. The sulphate of calcium formed falls to the bottom, and the acetate of aluminum remains in solution with an excess of alum, which is necessary to prevent its decomposition. It is of extensive use in calico-printing and dyeing, as a mordant, and is employed in the place of alum, to which it is generally preferred.

ALUMINITE, a mineral having the composition of a hydrous aluminum sulphate, $Al_2O_3.SO_3.9H_2O$, occurring in white reniform concretions in beds of clay in Germany, England and other European countries. It is opaque, of earthy lustre and fracture, and is sift and light.

ALUMINO-THERMICS, a term designed to embrace the processes of reduction of metals by taking advantage of the intense affinity for earthy lustre and fracture, and is soft and light. temperatures.

The principal industrial applications of these processes are: (1) The welding of iron and steel in place as in the uniting of railroad rails, and in repairing broken shafting and the like; (2) the production of pure metals and alloys free from carbon, nitrogen and other common impurities; (3) in foundry practice for reviving or increasing the temperature of molten iron or steel in the ladle before pouring; (4) in the manufacture of small castings and repairing flaws in large ones; (5) in surface softening of hardened steel to permit tooling or boring and the cutting of large openings.

In the welding process the aluminum is reduced to a powder or granulated and mixed with a metallic oxide, in most cases the oxide of iron. This mixture has been given the commercial name "thermit."

The chemical reaction, which consists in oxidizing the finely divided aluminum, is started by producing the high temperature necessary at only one point in the thermit. This is accomplished by a priming powder composed preferably of metallic magnesium and barium peroxide. The primer is ignited by a fiercely burning storm match or by touching it with a red-hot iron rod. The reaction then spreads spontaneously and with great rapidity and with considerable violence. In a few seconds the entire mass is a white-hot fluid at a temperature estimated to be about 5400° F.

In the crucible after the reaction there are two layers. The bottom one is pure metal of equal weight to, but occupying only one-third of the space of, the top layer, which is now oxide of aluminum, so-called corundum.

The most commonly employed of the welding processes is the one by which a continuous rail — a desideratum in modern trolley-road construction — is simply, cheaply and effectively obtained. The marked advantage enjoyed by this system is the freedom from bulky equipment; a crucible, a mold box and, in instances where a complete butt weld of the head of the rail is desired, a rail-clamp is all that is required. All these materials, including the necessary quantity of thermit, can easily be moved on a hand truck. Each weld, according to the section, requires from 15 to 20 pounds of thermit, and the metal welded around the joint will only weigh, therefore, from 8 to 10 pounds.

The thermit reaction takes place in a crucible which rests on a simple iron stand that can be attached to the rails or rail-clamps where such are used. The crucible consists of a sheet-iron mantle lined with magnesia or corundum slag, which is tamped round a sheet-iron conus suspended in its middle. The bottom is formed by a hard magnesia stone provided with a replaceable outlet which will stand 9 or 10 runs.

The life of the crucible itself is about 25 reactions. The crucible is plugged by two asbestos washers covered by a metal disk over the outflow or thimble. In the latter is suspended a piece of iron wire, the lower end of which projects below the base of the crucible. This is driven up by a blow and so "taps" the crucible. The heat of the thermic reaction might in spite of the asbestos washers burst through the plugging material. To prevent this the metal disk is further covered by a layer of magnesia sand.

The mold is made according to a special design for each section. Its two parts, one on each side, exactly fit and firmly enclose the rail. It must be dry and porous. On a large scale molds are made by manufacturers of refractory earthenware or by railway lines, according to their requirements, in their own shops, by tamping an ordinary mixture of loam and sand in equal parts into a sheet-iron case placed over the model. This sand mold must be dried during a couple of hours at a temperature of about 212° F. Before placing the mold round the joint, the rail ends are cleaned of dirt and rust with a wire brush and warmed with a gasoline torch. In case the tops of the rails are to be butt-welded the sections must be filed. The thermit is then poured into the crucible from bags containing. the necessary amount for each section. After the charge in the crucible has been ignited in the usual way the reaction takes its course and the crucible is tapped to allow the liquid steel to flow into the mold. The great heat of the liquid thermit steel literally melts and amalgamates the ends of the rails projecting into the molds, making them as one, so that when cool it leaves a continuous rail. The joint is stronger than an equal section of the rail, from the fact that a shoe or collar of metal is cast around the rail at the joint.

It has been found that there are no changes in the composition or temper of the steel in the rail and it is left just as it was, except that the ends are melted together up to, and generally a little above the bottom of the tread of the rail, and that a slight longitudinal expansion has taken place.

The so-called third rail is also welded by this means.

Steel girders for construction work can, of course, be welded in the same way as rails. Practically the same process is used in butt-welding pipe up to six inches diameter. In making marine and other large repairs thermit welding has proved invaluable, the mold being made and the work done in place, without removal to a foundry. In this way the broken crank shafts or rudder and stern posts of great steamships have been welded in a few hours.

Among the pure metals produced by the alumino-genetic reaction may be mentioned in the first instance chromium free of carbon. It is used in the manufacture of particular qualities of chromium steel with a limited percentage of carbon, and nowadays hardly any high-speed tool steel is made without it. Pure manganese also produced by this process finds employment in copper and nickel manufacture, and, furthermore, in the production of particular sorts of manganese steel of great strength and great elasticity with 12 to 14 per cent manganese, used particularly for bolts of machinery exposed to great strains. Pure molybdenum and ferro-vanadium have also lately been put on the market. Ferro-titanium has been in use with a number of steel works for quite a considerable time, to deoxidize the steel and remove nitrogen. It also gathers sulphur and phosphorus, and imparts density, toughness and strength. In addition to the pure metals several of their alloys are produced in exceptionally pure form by the alumino-thermic processes.

In foundry practice the thermit is plunged to the bottom of the molten metal in the pouring ladle or thrown upon the surface of metal in the riser. In making small castings required quickly the thermit is ignited in a flat-bottom crucible and in 30 seconds can be poured into the mold. Where more than 10 pounds of thermit is used it is necessary to add 10 per cent of clean steel punchings or rivets to the thermit to modify the intensity of the reaction. A further addition of 1 per cent of metallic manganese and 1 per cent of nickel thermit will improve the quality of the casting. In the replacing of parts broken off the desired form is modeled on to the work with yellow wax and the molding loam packed around it. The wax melts away when the work is heated preparatory to the pouring of the thermit steel.

In the use of thermit for locally softening armor plate and other hardened steel the powder is heaped within a confining ring and ignited. The heat generated is sufficient to affect the metal to a depth of two inches. From 30 to 40 pounds of thermit are required to the square foot.

Analyses of thermit steel show an average of carbon, .05 to .1 per cent; manganese, .08 to .1 per cent; silicon, .09 to .2 per cent; sulphur, .03 to .04 per cent; phosphorus, .04 to .05 per cent.; aluminum, .07 to .18 per cent.

The quarterly magazine *Reactions* is devoted to the alumino-thermic industry. Considerable work of this kind has already been done in Germany.

ALUMINUM, or **ALUMINIUM**, the most abundant of all metallic elements in the earth's crust, and ranking third among all the known elementary substances, following the non-metals oxygen and silicon. It is a large constituent of all common rocks, excepting only the sedimentary rocks — the sandstones and limestones — and forms about 15 per cent of the solid substance of the world. Aluminum is never found native, but in the form of oxide, fluoride, phosphate, silicate, sulphate, etc. Its most important ore, and that from which the whole commercial supply is produced, is known as bauxite (q.v.). This mineral is a hydrated silicate of aluminum, containing when pure, 74 per cent of alumina — 39 per cent of the metal. As it comes from the mines, bauxite is a mixture, containing not more than 50 to 60 per cent of alumina. For several years the State of Arkansas has produced more than 80 per cent of the bauxite mined in the United States, the remainder being supplied by Alabama, Georgia and Tennessee. The Tennessee product, however, being of especially high grade, is used in the manufacture of the chemical salts of aluminum, and very little, if any, reaches the furnaces which produce the metallic aluminum.

Practically all the metal produced in the United States is obtained by the Hall process. Alumina is first prepared by the Bayer process. Bauxite, very finely ground, is digested with caustic soda under steam pressure of 70 to 80 pounds, sodium aluminate being formed. This solution is filtered, diluted and run into tanks where it is agitated with freshly precipitated alumina. About 70 per cent of the alumina present is thrown down. This is washed free of sodium and the moisture evaporated. When dry, it is charged into an iron tank lined with carbon, containing a fused bath of cryolite, with some other admixtures, such as fluorite of sodium and fluorite of calcium, or similar ingredients, the nature of which is guarded as a trade secret. Above the vat are suspended a series of carbon anodes which may be lowered into the bath. The alumina being stirred into the fused cryolite, the anodes are lowered and the current turned on. The alumina is decomposed and the metallic aluminum collects in the bottom of the bath and is drawn off from time to time. The bath remains unaltered, and as the dissolved alumina is exhausted, more is stirred in, and the operation continues as long as the current is provided. The most scrupulous care is taken that the materials used shall be free from silica and sodium. The first reduces resistance to corrosion, and the second produces a yellowish coating particularly objectionable in aluminum cooking utensils. Plants for the economical production of aluminum have to be very large. The metal cannot be produced cheaply on a small scale.

Characteristics and Properties.— As found in the market, aluminum varies from 98 per cent to 99.75 per cent pure, the impurities being chiefly iron, silicon, copper and sometimes sodium. It is grayish white in color with a bluish cast, quite distinct from silver, nickel and tin. It has a satiny lustre and is practically unaffected by pure air, though in regions where the atmosphere is permeated with mixed gases from factory chimneys, sheet aluminum soon becomes perforated and eventually falls to powder. Owing to its great affirmity for oxygen, aluminum is almost instantly covered with a very thin pellicle of oxide which acts as a protection to the metal beneath. In hardness it closely resembles silver, and this may be considerably increased by working. In elasticity it compares with copper as three to four. Its thermal conductivity is very high, exceeded only by copper, and being double that of tin and three times that of iron. Its electrical conductivity is 61 per cent that of copper, so that wire to carry an equal charge must be 64 per cent larger in sectional area; that is, 28 per cent greater in diameter. Aluminum is sonorous to a high degree, and this quality is improved by the addition of a little silver or German silver. Aluminum is extremely ductile, and may be drawn into wire 1/250 of an inch in diameter, which has about half the strength of copper wire of the same size. In malleability, aluminum ranks next to gold. It may be rolled into sheets 17/10,000 of an inch in thickness, and these may be hammered into foil 1/10,000 of an inch in thickness. Its tensile strength is ordinarily from 6.5 to 15.5 tons per square inch, with a top limit for selected specimens of 29 tons. Weight for weight it has a tensile strength equal to that of 80,000 pound steel. Thus the weight of steel in an eight-inch girder would make a 15-inch girder of aluminum, which would carry 80 per cent more than the steel. Aluminum is non-magnetic and therefore exceedingly useful in much electrical work. Like lead, aluminum has the property of extrudability, and when warm may be pressed into a mold of any shape through a small opening. If the mold is of polished steel the aluminum will have a surface as perfect as if machined. By virtue of this quality it may be pressed into continuous bars and tubing of any length, and into engineering shapes of great strength, fancy moldings, cornices, etc. This property is also possessed by some of its hard alloys. Its atomic weight is 27; its atomic volume, 10.1; its specific gravity is 2.56, which is increased by rolling to 2.67; its specific heat ranges from 0.2120 to 0.2185. Its melting point is 1215° F. In fusing it expands about 5 per cent and its specific gravity falls to 2.54. Above 1300° F. the metal "burns"; that is, it unites very rapidly with the oxygen of the air.

Aluminum is not affected by organic acids, and resists well cold sulphuric and nitric acids, but dissolves speedily in hydrochloric acid. The alkalis readily decompose it. As compared with other metals, for a given gauge of plate, one ton of aluminum is equal in area to 2.7 tons of tin, 2.88 tons of iron, 3.33 tons of copper and 4.22 tons of lead. One pound of sheet aluminum of any thickness will cover 3⅓ times the area covered by a sheet of brass of the same thickness. Compared with copper, aluminum sheets are 25 to 50 per cent cheaper for the same area, 66 per cent lighter and in many cases much more durable.

Alloys.— Aluminum forms alloys readily with all the common metals except lead. The alloys which have been found more or less useful have been combinations of aluminum with copper, chromium, tungsten, titanium, molybdenum, zinc, bismuth, nickel, cadmium, magnesium, manganese, tin or antimony,— all of these alloys being distinctly harder than pure aluminum. A small percentage of manganese adds ductility to these alloys without reducing their strength. The copper-aluminum alloys, containing 10 to 11 per cent of aluminum, are known as aluminum-bronze. These alloys are not corroded by sea water, making them of special value for marine fittings. (See BRONZE). When aluminum is alloyed with 7 to 10 per cent of copper, a tough metal results; it is especially useful in automobile parts and other construction forms which are subjected to sudden and severe shocks. The zinc-aluminum alloys yield a metal eminently adapted for forging, being tough and flowing well under dies. Some of the zinc-aluminum alloys are but little heavier than pure aluminum, are as rigid as bronze, and machine as readily as brass. They are very extensively used in making motor casings for automobiles and aircraft. With iron, aluminum combines in all proportions, but the alloys of most value are those with very small percentages of aluminum. This is true especially of steel, to which the usual addition of aluminum is from two ounces to 12 ounces per ton. In this quantity the aluminum is essentially a deoxidizer, and while

increasing the steel in tensile strength, its chief effect is to produce smoother and more homogeneous ingots. With cast iron the addition of aluminum is from one to two pounds per ton, lessening the tendency to chill, causing it to flow smoothly and giving it a closer grain. In wrought iron, aluminum increases the tensile strength 30 per cent and renders the iron more fluid at 2200° F. than at 3500° without it. With 2 to 10 per cent of magnesium, aluminum forms an alloy lighter even than its normal weight. This alloy goes by the name of magnalium and is equal in strength and workability to good brass. With 1 to 15 per cent of tin a series of strong and rigid alloys is produced, suitable for heavy castings. Aluminum-tungsten and aluminum-nickel make good rolling metal for sheet forms. Alloys of aluminum with 3 to 4 per cent of copper or with 2 to 5 per cent of nickel are also very largely used for rolling into sheets. All brass is improved by the addition of small percentages of aluminum, a 2-per cent addition doubling its tenacity. Aluminum has the effect generally of lowering the melting point of the alloy. Added to gold in the proportion of 1 per cent, the resulting alloy is known as "green gold." Five per cent of aluminum will quench the color of the gold, yielding a white metal. With silicon aluminum combines in all proportions, but these alloys are brittle and are not permanent. With platinum and cadmium it forms fusible metals (q.v.). An alloy consisting of 96 parts aluminum, three parts copper and one part of magnesium is known commercially as "duralumin." It has been used extensively in making shells, helmets, grenades and camp equipment during the European War.

Welding and Plating.— The great difficulty of soldering aluminum has been overcome by the process of autogenous welding and thus the making of tanks and vessels of the largest sizes has become practicable. In this welding process the sheets of aluminum are lapped, and a pure aluminum wire laid between, with a flux, generally a mixture of fluorides of the alkalis. The heat used may be the oxy-hydrogen flame, the oxy-acetylene torch or even the air-acetylene flame. Aluminum is successfully plated with other metals by first plating it with zinc upon which the other metals are then deposited in an electrolytic bath.

Uses.— The uses of aluminum are almost without number. More than 250 articles are made from the pure metal and nearly as many more from its alloys, and the list is continually being extended. Among them are aeroplane parts, automobile parts and bodies, blades for fans, buttons, camp equipment, chains, cooking utensils, dental plates, foil for wrapping food products and confectionery, gas and oil stoves, hair and hat pins, horseshoes, frames for mirrors and pictures, penholders, army pontoons, optical goods, scientific instruments, stoves and stove pipe, telephone fixtures, telescope tubes, trunks and traveling cases and vacuum cleaners. In the arts aluminum has replaced other metals, notably in the brewing industry. The great fermentation vats are now made of aluminum instead of copper, as the former has no deleterious effect upon the growth of yeast, as has the former. In varnish making also, the use of aluminum kettles affords a paler varnish from the same gums, or a varnish of the same color from darker gums. The resistance of aluminum to stearic and oleic acids makes it of the greatest value in soap making. In sugar refineries the copper piping is now lined with aluminum instead of tin as formerly. In iron and steel founding powdered aluminum is used to keep up the heat of molten metal, which it does by uniting with the oxides with great energy. This property of powdered aluminum is the basis of the action of thermit. (See ALUMINO-THERMICS). The powdered metal is used also in the manufacture of the explosive "ammonal." Mixed with ammonium nitrate in varying proportions it forms a series of safe explosives which cannot be fired without a detonator, but range in power from common black powder to nitroglycerine. These explosives are of particular value in mining, as the resulting gases are entirely harmless, being nitrogen, oxygen and steam. Powdered aluminum is used extensively in the painters' trade as a foundation for bronze powders, in which it excels all other metals. In electrical transmission cables it has found a new utility, the cables being drawn on a steel core, which renders them strong enough to stand the weight of long suspensions as well as the force of the wind and the weight of ice storms.

History.— While the fact that argillaceous earth concealed a new metal had been known for some years, the first production of metallic aluminum was not accomplished until 1824, when Oersted succeeded in making it by heating aluminum chloride with potassium amalgam. In 1827 Wohler obtained it by a closely similar method. In 1854 Bunsen and Deville independently produced metallic aluminum by the electrolytic process. The credit of pursuing the problem of a successful commercial process belongs to Deville, who persistently worked, first at Javel, then at Nanterre and finally at Salindres, with the double chloride of aluminum and sodium as his source. When cryolite was discovered, Messrs. Dick and Smith, at the suggestion of Dr. Percy, made successful use of that mineral as a source of metallic aluminum. Deville accepted the improvement, but finding the metal from cryolite quite impure, he returned to his former crude material, adding the cryolite to his own mixture, however. Deville's process furnished the metal at a cost of $5 a pound until 1887, when several inventions in other fields were applied to the commercial production of aluminum. Since that time the price has steadily dropped until it has reached its present normal of about 18 to 20 cents a pound. The war has had its effect upon aluminum as well as upon all other metals, but with the return of settled conditions lower prices will again prevail.

Production.— The French periodical *L'Echo des Mines* estimates the potential production of aluminum by the world's existing plants as follows:

United States and Canada	75,000 tons
France	20,000 "
Switzerland	20,000 "
United Kingdom	12,000 "
Norway	16,000 "
Italy	7,000 "
Total	150,000 tons

The production of aluminum in the United States in 1916 amounted to 123,708,000 pounds.

In addition to this output of metal, there were produced 153,860 tons of aluminum sulphate, 27,257 tons of alum and 30,708 tons of aluminum abrasives. (See ABRASIVES). In 1885 the commercial production of aluminum was 283 pounds. From that year to the present, including the 1916 output, the total production of metallic aluminum in the United States has been 680,380,500 pounds.

ALUM-ROOT, the name given in the United States to two plants on account of the remarkable astringency of their roots: (1) *Geranium maculatum,* or spotted cranesbill, is a native of North America from Canada to North Carolina; it has an angular, downy stem, 3-5-parted leaves with deeply toothed lobes, obovate entire petals, the filaments scarcely ciliated at the base; the color of the flowers is a pale lilac. It is employed successfully as a remedy in dysentery among children; the tincture is recommended in cases of ulcerated sore throat, soreness of the gums, etc. The plant contains large proportions of gallic acid and tannin. (2) *Heuchera americana* family (*Saxifragaceæ*) is a hairy plant with rough scapes and leaves, the latter being on long petioles, 5-7-lobed, toothed; the calyx is 5-cleft, petals undivided, five stamens; the styles are remarkably long. It contains tannin and is used in preparing a wash for wounds, ulcers, etc.

ALUM-SHALE, a slaty rock of different degrees of hardness; color grayish, bluish or iron-black; often possessed of a glossy or shining lustre. It is chiefly composed of clay (silicate of alumina), with variable proportions of sulphide of iron (iron pyrites). lime, bitumen and magnesia. It is found abundantly, and from it is obtained the largest part of the alum of commerce.

ALUNITE, al'ū-nīt, a native subsulphate of aluminum and potassium, having the formula $K(AlO)_3(SO_4)_2+3H_2O$, and occurring both massive and in rhombohedral crystals resembling cubes. It is white with a vitreous lustre, with a hardness varying from 3.5 to 4, and a specific gravity of about 2.6. It has been found, in the United States, in California and Colorado. According to Dana it was first called "aluminilite," a name afterward abbreviated to the present form. Alum may be obtained from it by repeated roasting and lixiviation. (Also called alum-stone and alum-rock).

ALUNNO, Niccolo (real name NICOLÒ DI LIBERATORE), an Italian painter of the 15th century, the founder of the Umbrian School: b. Foligno about 1430; d. 1502.

ALUNOGEN, a-lū'nō-jen, a native hydrous sulphate of aluminum, having the formula $Al_2(SO_4)_3+18H_2O$. It occurs massive, as an incrustation in mines and quarries, and also in delicate fibrous forms. Its hardness varies from 1.5 to 2, and its specific gravity is about 1.7. It occurs in large quantities in Jackson County, N. C., and near Silver City, N. M.; and it is found in many other parts of the United States in small amounts.

ALUREDUS, an English historian: b. about 1100. See ALFRED OF BEVERLEY.

ALVA, äl'vą, or **ALBA, Ferdinand Alvarez de Toledo,** DUKE OF, Spanish statesman and general: b. 1508; d. Thomar, 12 Jan. 1582. He was educated by his grandfather, Frederick of Toledo, who instructed him in military and political science. He commanded under Charles V in Hungary, and was present at the siege of Tunis and in the expedition against Algiers. His cautious character and his inclination for politics at first led men to believe that he had but little military talent; and his pride being touched at the low estimation in which he was held, his genius was roused to the performance of exploits deserving remembrance. He won in 1547 the battle of Mühlberg against John Frederick, Elector of Saxony, and in 1555 was commissioned to attack the French in Italy, and Pope Paul IV, the irreconcilable enemy of the Emperor. When Charles V resigned the government to his son, Philip II, Alva received the supreme command of the army and conquered the states of the Church and frustrated the efforts of the French. Philip. however, compelled him to contract an honorable peace with the Pope, whom Alva wished to humble. He appeared in 1559 at the French court in order to marry Elizabeth, the daughter of Henry II, by proxy, for his sovereign; she had been at first destined for the crown prince, Don Carlos. About this time the Netherlands revolted, and Alva was entrusted with a considerable army and unlimited power to reduce the rebellious provinces. Scarcely had Alva reached Flanders at the end of August 1567, when he established the Council of Blood, at the head of which stood his confidant, Juan de Vargas. This tribunal condemned, without discrimination, all those whose opinions were suspected and whose riches excited their avarice. The present and absent, the living and the dead, were subjected to trial and their property confiscated. The cruelty of Alva was increased by the defeat of his lieutenant, the Duke of Aremberg, and he caused the Counts of Egmont and Hoorn to be executed. He afterward defeated the Count of Nassau on the plains of Gemmingen. Soon after the Prince of Orange advanced with a powerful army, but was forced to withdraw to Germany. The Duke stained his reputation as a general by new cruelties, his executioners shedding more blood than his soldiers. The Pope presented him with a consecrated hat and sword, a distinction previously conferred only on princes. Holland and Zealand, however, still resisted his arms. A fleet fitted out at his command was annihilated, and he was everywhere met with insuperable courage. This, and perhaps the fear of losing the favor of the King, induced him to request his recall. Philip willingly granted it, as he perceived that the resistance of the Netherlands was rendered more obstinate by these cruelties, and was desirous of trying milder measures. In December 1573 Alva proclaimed an amnesty, resigned the command of the troops to Louis de Requesens, and left the land in which he had executed 18,000 men, as he himself boasted, and kindled a war that burned for 68 years, cost Spain $800,000,000, its finest troops and seven of its richest provinces in the Low Countries. Alva led an army into Portugal, gained two battles in three weeks, drove out Don Antonio, and reduced all Portugal, in 1581, to subjection to his sovereign. He made himself master of the treasures of the capital and permitted his soldiers to plunder the suburbs and surrounding country with their usual rapacity

and cruelty. It is said of him that during 60 years of warfare he never lost a battle and was never taken by surprise.

ALVA, Okla., city and county-seat of Woods County, 150 miles northwest of Oklahoma City, the capital of the State, on the Canadian River, and on the Atchison, Topeka and Santa Fe and the Chicago, Rock Island and Pacific railroads. It contains flour mills, broom factories and dairy establishments, and has important interests in the agricultural products of the district, which produces wheat, corn, oats and alfalfa. It contains a hospital, city hall, court-house, library, opera house, two modern school buildings and the Northwestern State Normal School. The waterworks are the property of the city. Pop. 3,688.

ALVARADO, äl'vą-rā'dō, **Pedro de,** a Spanish soldier of fortune, the companion and lieutenant of Cortez: b. Badajoz about 1499; d. 1541. He was of good family, his father being a knight of the order of St. James. In 1518 he accompanied Grijalva in a small expedition sent by Velasquez, governor of Cuba, to explore the American coast. A considerable amount of the precious metals was obtained by barter, and Alvarado was despatched to Cuba with this treasure and with a report of the regions which had been explored. When Cortez was called away to meet Narvaez, who had been sent by Velasquez with a superior force to supersede him in command, he left the capital and his royal captive, Montezuma, in Alvarado's charge, and in 1523 was sent with a considerable force to reduce the tribes of Indians in the direction of Guatemala. Having beaten off all opponents he founded a city now called Guatemala la Vieja, and established a port on the Pacific, which he called Puerto de la Posesion. Embarking for Spain, he was received with great honor by the Emperor, Charles V, who, in acknowledgment of his services, made him governor of Guatemala. He shortly returned to America with a numerous band of knights and kinsmen, and Guatemala speedily became a prosperous city. An attempt which he subsequently made on Quito, but which he was induced to relinquish, was resented by Pizarro as an intrusion within the boundaries of his command, and he embarked a second time for Spain to vindicate his conduct to the Emperor.

ALVARADO, Tomás Antonio, Ecuadorean clergyman: b. Cuenca, Ecuador, 18 Sept. 1860. He was educated at the Christian Brothers College and the Ecclesiastical Seminary of his native city. While still a student he was appointed superior of the seminary and professor of grammar, literature, French and Latin. He was ordained to the priesthood in 1886 and soon after was named dean of the faculty of philosophy at the University of Azuay. In 1898 he was exiled for a time by the government because of his opposition to the law "El Patronato." He has held official positions as municipal councillor and commissary of the Fiscal Revenue Commission. He was twice elected deputy to the National Congress, but each time declined to serve. He is the author of 'Estética literaria,' 'Ortologia francesa' and 'Versificación francesa,' which are used as textbooks in several schools; also of a number of poems, religious and secular. He is a frequent contributor to various ecclesiastical periodicals.

ALVAREZ, ąl-vä'rāth, Don **José,** Spanish sculptor: b. Priego 1768; d. 1827. In 1799 Charles IV gave him a pension of 12,000 reals to enable him to study in Paris and Rome. In Paris he executed a statue of Ganymede, which at once placed him in the front rank of the sculptors of his time. Another successful work was a group representing Antilochus and Memnon, which secured for the artist the appointment of court sculptor.

ALVARY, ąl-vä'rē, **Max,** German singer: b. Düsseldorf 1858; d. 1898. Gifted with a fine tenor voice and handsome presence he speedily made a reputation in Germany in the leading rôles in Wagnerian opera, and from 1885 onward appeared also in America and England. His performances as Tristan and Siegfried aroused great enthusiasm.

ALVENSLEBEN, äl'vĕns-lā'bĕn, **Constantin Von,** German army officer: b. Eichenbarleben, Saxony, 26 Aug. 1809; d. Berlin, 28 March 1892. He distinguished himself in the campaign against Austria in 1866 and in 1870 as commander of the 3d army corps he contributed greatly to the success of the German arms before Metz by his resolute leading, energy and determination.

ALVERSTONE, Sir **Richard Everard Webster,** 1st viscount A.; British lord chief justice: b. 22 Dec. 1842; d. 15 Dec. 1915. He was educated at King's College, Charterhouse and Trinity College, Cambridge. In 1868 he was called to the bar and became Q. C. 10 years after. He was appointed Attorney-General in the Conservative government in June 1885. He was elected for Launceston in the following month, and later sat for the Isle of Wight, which he continued to represent until his elevation to the House of Lords. Except under the brief Gladstone administration of 1886 and the Gladstone–Rosebery administrations of 1892–95, Sir Richard Webster was Attorney-General from 1885 to 1900. In 1893 he represented Great Britain in the Bering Sea arbitration, and five years later he discharged the same function in the matter of the boundary between British Guiana and Venezuela. In 1900 he succeeded Sir Nathaniel Lindley as master of the rolls, at the same time being raised to the peerage as Baron Alverstone. In October of the same year he was elevated to the office of lord chief justice upon the death of Lord Russell of Killowen. In 1903 Lord Alverstone presided over the Alaska boundary tribunal, and his decisions favoring American claims, particularly with regard to the mountain boundary, were severely criticized in Canada, and to a lesser degree in England. He resigned the office of lord chief justice in 1913 and was succeeded by Sir Rufus Isaac (now Lord Reading). He published 'Recollections of Bar and Bench' (1914).

ALVEY, Richard Henry, American jurist: b. 1826; d. 14 Sept. 1906. He was admitted to the bar in 1849; was a member of the Maryland State Constitutional Convention; chief judge of the fourth judicial circuit, and a judge of the Maryland Court of Appeals (1867–83) and chief justice (1883–93); became chief justice of the Court of Appeals of the District

of Columbia in 1893, and one of the Venezuela boundary commissioners in 1896.

ALVORD, Benjamin, American soldier: b. Rutland, Vt., 8 Aug. 1813; d. 17 Oct. 1884. Received a military education at West Point and after serving in the second Seminole War and in the Mexican War also, was paymaster of the department of Oregon, 1854–62. He was brigadier-general of volunteers, 1862–65, retiring from the service in 1881 with the rank of brigadier-general. He published: 'Tangencies of Circles and of Spheres' (1855); and 'The Interpretation of Imaginary Roots in Questions of Maxima and Minima' (1860).

ALVORD, Henry Elijah, American soldier: b. Greenfield, Mass., 11 March 1844; d. 1904. He entered the army in 1862 and had risen to the rank of major in 1865. He was a cavalry captain in the regular army 1866–72, and chief engineer on General Sheridan's staff 1868–69. From 1886 to 1888 he was professor of agriculture in the Massachusetts Agricultural College, and was president of the Maryland Agricultural College 1888–92. He was for many years prominent as an authority on agricultural questions.

ALWAR, ŭl'wŭr, India, town and capital of the Rajput state of same name, situated at the base of a rocky range of quartz and slate, 80 miles south southwest of Delhi. The Rajah's palace is of cubical form and has its walls pierced with numerous small windows and is decorated with rude and glaring paintings; a pavilion of white marble, built by the late Rao Rajah, near a very deep tank which he had executed, displays no small degree of taste; and there are several Hindu temples in a style imitated from Mohammedan structures. A fort, crowning the lofty mountain which overhangs the town, is highly ornamented and serves the Rajah both as a summer palace and as an asylum in times of danger. Modern buildings include the Lady Dufferin hospital for women, a high school for young noblemen, and Catholic and Presbyterian churches. Pop. 41,500.

ALYTES, a'lī-tēz, the midwife toad, first discovered by P. Demours in 1741, on the border of a small pond in the Jardin des Plantes, in the very act of parturition which has rendered it famous. *Alytes obstetricans* is of special interest as the first known example of paternal solicitude in Batrachians, and although many no less wonderful cases have since been revealed to us, it remains the only one among European forms.

ALZOG, äl'tsôg, **Johann Baptist,** German theologian: b. Ohlan, Silesia, 29 June 1808; d. 1 March 1878. He studied at Breslau and Bonn and was ordained priest at Cologne in 1834. He was professor of church history at Posen 1835–44 and at Freiburg from 1844 until his death. With Döllinger he was instrumental in convoking the famous Munich assembly of Catholic scholars in 1863. He also took part in the preparatory work of the Vatican council. His fame rests mainly on his 'Manual of Universal Church History,' which is generally accepted as the best exposition of Catholic views.

AMADIS DE GAULA, the most famous romance of chivalry in prose, was printed in its earliest extant edition at Saragossa in 1508. Its author was Garci Rodriguez or Ordoñez de Montalvo, governor of Medina del Campo in Old Castile, whose avowed purpose was to draw from "the ancient originals," which have since perished, a story that might inspire Spanish youth with a desire to emulate the noble deeds of knighthood. Montalvo, in expanding what seems to have been a Portuguese model from three books to four, and in adding a fifth, started upon its career the fiction destined to unfold in more continuations than any other known to literary history. It is presumed that the writer of the Portuguese original was João de Lobeira, a member of the poetical circle of King Denis of Portugal in the late 13th century. Like others of his coterie, Lobeira was subject to French influence and acquainted with legends of the prowess of the knights of King Arthur and Charlemagne; but his 'Amadis' is distinguished from romances of the Arthurian and Carlovingian cycles by being wholly fictitious, founded neither upon tradition nor upon history. Another Lobeira of the 14th century (Vasco, q.v.) has been credited with the authorship of the Portuguese 'Amadis,' since its ascription to him by a chronicler of the 15th century. His claim, however, is now no longer accepted by scholars, who at most will concede to him a later manuscript version rumored to have been lost in the Lisbon earthquake. In any case, 'Amadis' achieved its renown, not in the Portuguese of either Lobeira, but in the Spanish of Montalvo, who probably had Castilian as well as Portuguese versions upon which to draw. If the origin of 'Amadis' be obscure, its place among the monuments of literature is certain. As Cervantes declared in 'Don Quixote,' it is "the best of all books of this kind that have ever been written." It is also, according to Prof. F. M. Warren, "our first modern novel." The time of the story is "not long after the Passion of our Lord"; its scenes are laid in a mythical Great Britain and an imaginary Firm Island. Gaula signifies Wales; Amadis of Gaul is a prince of Wales born of a secret amour, reared as a knight, and serving devotedly the fair English princess Oriana. For her sake he contends against monsters and enchantments, defends her father's kingdom from an oppressor, and opposes the Roman emperor as rival. He wins a victory over the emperor, whose suit is favored by the lady's father, but, in his hour of triumph, consents to spare the latter, and at last is formally united to Oriana in marriage. High ideals mark the work — pride, honor, valor, love, loyalty to the king, and religion. It contains nothing of the extravagant code of faith and honor which grew up in the Spanish decadence, and exhibits comparatively little of the absurdity so characteristic of its fantastic continuations. Of such continuations the first was Montalvo's "Fifth Book" entitled 'The Deeds of Esplandian,' its hero the son of Amadis and Oriana. Most others followed the fortunes of some one of Esplandian's descendants, professing to be but additional books of the original 'Amadis.' That original may be read in Robert Southey's abridgment of its Elizabethan translation by Anthony Munday. The English reader should also consult Prof. F. M. Warren's 'History of the Novel Previous to the Seventeenth

Century' (1894). The best Spanish treatment of 'Amadis' is to be found in Marcelino Menéndez y Pelayo's 'Origenes de la novela' (1905).

FRANK W. CHANDLER,
Professor of English and Comparative Literature, University of Cincinnati.

AMADO DE CONTRERAS, Ramón Ruiz, Spanish clergyman and writer on education: b. Castello d' Ampurias, Catalonia, Spain, 14 Jan. 1861. He received his education at the University of Barcelona; practised law from 1881 to 1884, when he entered the Society of Jesus. He was ordained to the priesthood in 1896 and in the same year was appointed teacher of humanities, Latin and Greek at the Vernela Scholasticate. He spent several years in literary work in the interests of education and in traveling in Germany, England and South America. In these travels he made a special study of the educational systems of Germany, England, Argentina, Uruguay and Chile. In 1906–10 he was associate editor of *Razón y Fe,* and in 1910 became the founder of the review *La Educación Hispano-Americana.* He is one of the founders of the Academia Universitaria Católica de Madrid and for a time was professor of higher pedagogy. He has published several works on education, including: 'La Educación moral,' 'La Educación intelectual,' 'La Educatión religiosa,' 'Historia de la educación y la Pedagogia,' 'Educación femenina,' 'Educación civica,' 'Didactica ó el Arte de enseñar,' 'Compendio de Historia de España,' 'La Iglesia y la libertad de enseñanza,' 'La Historia de los Papas,' translated from the German of Ludwig Pastor. He was a contributor to the 'Catholic Encyclopedia' and of numerous articles on education to *Razón y Fe.*

AMADOR, ä'mą-dōr, **Manuel,** the 1st President of the Republic of Panama: b. 1841; d. 1909. He was for many years minister of France in Panama. He was soldier, statesman, scholar and diplomat and was largely instrumental in establishing the new republic of Panama (q.v.) He adopted the practice of medicine in early life and became eminent in his profession. He sided with the revolutionist party against Colombia, which achieved the independence of Panama. Elected President of the new republic, 17 Feb. 1904, he was inaugurated to hold office four years and at the expiration of his term declined renomination. Since then the principal fortification of the Pacific end of the Panama Canal has been named in his honor, Fort Amador.

AMADOU, äm'ą-doó, a soft leathery substance obtained from certain fungi, chiefly *Polyporus fomentarius* and *P. igniarius,* which are parasitic upon the trunks of trees. It is prepared chiefly in Germany by slicing the fungus and soaking the slices in a solution of saltpeter. It is used for tinder and in surgery as a moxa or styptic. It is also known as German tinder and punk.

AMAL, the name of the noblest family among the Ostrogoths, and that from which nearly all their kings were chosen.

AMALEKITES, an ancient tribe in the southeast of Palestine, frequently mentioned in the Old Testament as enemies of the Israelites. The name is celebrated in Arabian tradition, but the statements in regard to them are conflicting and confused and almost worthless from a historical point of view. They appear as a branch of the Edomites (Genesis xxxvi, 12), Amalek being represented as the son of Eliphaz, who was himself the son of Esau by Timna, a Horite woman. When the Israelites journeyed from Egypt to Canaan the Amalekites are said to have harassed them and because of this hostility it was divinely ordered that their memory should be blotted out (Deut. xxv, 17–19). A victory by them over Israel is mentioned (Num. xix, 45) and a defeat at Raphidin (Ex. xvii, 8–16). The statements, however, are obscure and the situation is further complicated by the account of Joshua's victory over the Amalekites in the Sinaitic peninsula. According to 1 Sam. xv, Saul received a divine command to destroy the tribe because of its enmity to Israel, and David conquered a marauding band of these ancient enemies of his people. The spirit of hostility is shown also in Balaam's prophecy "Amalek, first of nations, his latter end (will be) destruction" (Num. xxiv, 20). Even in the Psalms (lxxxiii, 7) Amalek is cited as the traditional enemy of Israel; later in the Book of Esther Haman, the arch-enemy of Israel, is termed "the Agagite," emphasizing his descent from Agag, King of the hated race, and is opposed to Mordecai the Bengamite. Consult Grimme, 'Mohammed' (1904); Meyer, Eduard, 'Die Israeliten und ihre Nachbarstämme' (1906); Nöldeke, 'Ueber die Amalekiter' (Göttingen 1864), and Schmidt 'Messages of the Poets' (1911).

AMALFI, ą-mäl'fē, Italy, town and archiepiscopal see of Campania, in the province of Salerno. It lies 12 miles southwest from the town of Salerno, at the mouth of a deep ravine, in the centre of splendid coast scenery, and is in consequence much frequented by tourists. It contains a splendid cathedral of the 11th century and a Capuchin monastery (now used as a hotel) with fine cloisters. In the 9th century it had a considerable trade with the East and was then an independent republic, with a population of some 70,000. In 1343 a large part of the town was destroyed by an inundation and its harbor is now of little importance. Its industries, too, have declined, and the paper manufacture has lost ground since 1861. Pop. (1911) 6,681.

AMALGAM, an alloy in which mercury is an important constituent. Silver and gold amalgams occur in nature to a limited extent, but most of the amalgams are of artificial origin. Four general methods of forming them may be noted: (1) By direct contact of mercury with the metal to be amalgamated. Amalgams of antimony, arsenic, bismuth, cadmium, gold, lead, magnesium, potassium, silver, sodium, tellurium, thorium, tin and zinc may be obtained in this way. The different elements mentioned combine with the mercury with varying manifestations of affinity, the amalgamation of sodium being attended with the production of heat and light, while in the case of zinc it is often necessary to bring the zinc and mercury together in the presence of dilute acid before they will combine evenly and smoothly. (2) By immersing the metal to be amalgamated in a solution of a salt of mercury. Copper,

gold, platinum and silver can be amalgamated in this way. (3) By reversing the process last described and bringing mercury in contact with a salt of the metal whose amalgam is desired. The mercury, in certain cases, will partially replace the metal in solution, the portion so replaced combining with the mercury with the production of the desired amalgam. A valuable modification of this method consists in substituting for the metallic mercury an amalgam of zinc or of sodium, the zinc or sodium changing places with the metal in solution. Amalgams of bismuth, calcium, chromium, iridium, iron, magnesium, manganese, osmium, palladium and strontium may be prepared by the use of sodium amalgam. (4) By electrolysis, the metal whose amalgam is desired being used as the cathode in a solution of a mercurial salt. (The cathode may also be metallic mercury, and the electrolyte a salt of the metal whose amalgam is desired). This process is in commercial use for the production of sodium hydrate, a solution of sodium chloride (common salt) being electrolyzed with a mercury cathode. The cathode absorbs the sodium with the formation of sodium amalgam, which is subsequently decomposed by contact with water. In practice the process is continuous, a part of the mercury cathode being exposed to the electrolytic bath, while another part is simultaneously exposed to the action of the water.

In the formation of amalgams there is usually but little thermal effect. In the case of sodium and potassium, however, a very considerable amount of heat is evolved; and in the formation of amalgams of bismuth, lead and tin, heat is absorbed.

There is considerable evidence in favor of the view that many amalgams contain definite compounds of mercury and the other constituent metals. Thus when certain amalgams are heated (say) to the boiling point of sulphur, the excess of mercury present appears to be volatilized, so as to leave a body behind that has a definite chemical composition. In this way Sonza obtained amalgams having the apparent composition Au_5Hg, $Ag_{13}Hg$, $Cu_{16}Hg$, Na_2Hg, and K_2Hg, the last-mentioned being silvery in appearance and crystalline in structure. But it is said that all these amalgams, as well as many others, continue to lose mercury slowly when the temperature is maintained high; and this fact, while not disproving the existence of a definite compound of mercury and the metal, lessens its probability. Amalgams having the composition CuHg, AgHg, FeHg, Zn_2Hg, Pb_2Hg and $PtHg_2$ have also been prepared by expelling the excess of mercury from amalgams richer in that metal by exposure to a pressure of 70 tons to the square inch. One of the most interesting amalgams from the standpoint of chemical theory is the amalgam of the hypothetical radical "ammonium," which is described under AMMONIA.

The affinity of mercury for gold is put to practical use in mining for the recovery of small particles of gold from auriferous gravel or crushed quartz. The details of the process vary somewhat according to the nature of the material from which the gold is to be extracted; but in general it may be said that the pulverized gold-bearing quartz or gravel is washed, in a finely divided state, over a plate of amalgamated copper, to which the gold particles adhere. From time to time the gold amalgam is scraped from the copper plate and more mercury is added. The presence of sulphur (from pyrites) seriously interferes with this process, by causing the formation of a sulphide of mercury which destroys the efficiency of the amalgamated plate. The mercury is then said, in miners' parlance, to become "sick." To prevent this the ore, if originally rich in pyrites, is roasted to expel the sulphur before being submitted to amalgamation. See GOLD.

Mirrors are silvered by amalgams. One of the simplest of those so used is composed of one part of tin to three of mercury. A superior amalgam for this purpose contains two parts of bismuth, one part each of lead and tin and four parts of mercury. In dentistry the "silver filling" used for closing the cavities in teeth is an amalgam. Its composition varies somewhat, but a preparation containing two parts of mercury and one part of pulverized zinc gives excellent results. It hardens quickly and expands slightly in solidifying, thus filling the cavity tightly. Amalgams of copper, silver, lead and tin have a volume smaller than the sum of the volumes of their constituents. See BATTERY.

AMALTEO, ä-mäl'tā-ō, **Pomponio,** Italian painter: b. San Vito 1505; d. there 1584. He was a pupil and son-in-law of Pordenone, whose style he closely imitated. His works consist chiefly of frescoes and altar-pieces and many of them have suffered greatly from the ravages of time.

AMANA, äm'ą-ną, Iowa, town in Iowa County, 28 Miles west of Iowa City, the site of a German communistic religious colony founded in 1885. It includes the seven villages of Amana, the oldest and largest; East Amana; Middle Amana; High Amana; West Amana; South Amana and Homestead. The society is governed by a president and a board of 13 directors, and each village is controlled by seven or more elders appointed by the board of directors. Family life is kept up, but in every village are from four to 16 "kitchen-houses" where meals are prepared and served. The community owns and operates woolen, flour and saw mills, dye shops, machine shops and other industrial establishments, and agriculture is extensively followed. The inhabitants dress plainly and in sober colors. The community is primarily a religious organization, and the sect itself dates its founding from Eberhard Gruber, in Würtemberg, in 1714. By its members it is known as "The Community of True Inspiration." The total value of their property comprising 26,000 acres of land is valued at $1,800,000. Pop. 1,729.

AMANITA, a genus of fungi related to the genus *Agaricus,* to which the common mushroom belongs, and for which two of its poisonous members (see below) are sometimes mistakenly eaten. *A. muscaria,* the fly mushroom, so called from its use as a decoction in milk for killing flies, is commonest in the birch, beech and pine woods of Europe and America. It has a variously colored cap — white, yellow, orange, red, etc.— usually warted above and sometimes four or more inches in diameter; white or occasionally yellow gills, and a long

white stem with bulbous base. Though universally considered poisonous it is said to be used by certain Old World peoples to produce a kind of intoxication. *A. phalloides*, death-cup, deadly agaric, deadly amanita, is commonly found in woods, especially in damp weather, from early summer until mid-autumn. It is usually white, sometimes light yellow or grayish; its cap is seldom as large as four inches in diameter; its gills white; its stem hollow and slender above, solid and bulbous at the base, which is surrounded by a cup which has suggested one of its common names. With reasonable caution on the part of the collector none of these species should be mistaken for the common mushroom, because all three grow singly in woods and have white gills and white spores; whereas the mushroom grows in clumps in pastures and upon lawns, occasionally in grassy open woods. Its gills are pink in young specimens and darker in old ones; its spores dark-colored, and it has no cup at the base of the stem.

AMANITIN, a strongly basic ptomaine (or perhaps leucomaine) occurring in the poisonous fungus *Amanita muscaria* (*Agaricus muscarius*), or fly agaric. Amanitin is not poisonous, but is converted by oxidation into muscarin (q.v.), to which the deadly effects of the fly agaric are due. Amanitin is believed to be identical with cholin, neurin and sincalin. See NEURINE.

AMANUENSIS, a Latin word, derived from the phrase *servus a manu*, slave of the hand, a secretary, one who writes, from dictation or otherwise, on behalf of another.

AMAPALA, ą-mä'pą-lą, Honduras, a seaport on the north shore of the island of Tigre, in the bay of Fonseca. It has an excellent harbor and carries on an important exporting trade in silver, coffee, indigo, timber, hides and fish. It was founded in 1838. Pop. 4,000.

AMARA. See KUT-EL-AMARA.

AMARA SIN'HA, Sanskrit grammarian: lived about 375 A.D. Of his personal history hardly anything is known. Amara seems to have been a Buddhist; and a tradition asserts that his works, with one exception, were destroyed during the persecution by the Orthodox Brahmins in the 5th century. The exception is the celebrated 'Amara-Kosha' (Treasury of Amara), a vocabulary of Sanskrit roots, in three books, and hence sometimes called 'Trikanda' or the 'Tripartite.' It contains 10,000 words, and is arranged, like other works of its class, in metre, to aid the memory. An edition of the entire work, with English notes and index, appeared in 1808. The Sanskrit text was printed at Calcutta in 1831.

AMARANTHUS, the typical genus of herbaceous plants of the family *Amaranthaceæ*. This family consists of apetalous plants chiefly inhabiting tropical countries, and remarkable for the white or reddish scales of which their flowers are composed. In some species the flowers preserve their appearance after they are plucked and dried, and on this account poets make the plant an emblem of immortality. The name is from the Greek, meaning "not withering," and was originally *Amarantus*. The family contains about 500 species, some of which, as love-lies-bleeding, prince's feather and cockscomb are common garden plants. In the wild state they are mostly troublesome and unsightly weeds, of which the tumbleweed and pigweed are well-known American examples. Some of the foreign plants are cultivated as pot herbs, and others for their medicinal properties. Their chief commercial value is as decorative plants, for which purpose immense quantities are used in the southern parts of Europe, where they are employed to ornament the churches when fresh-grown blooms are not procurable. The seeds of some species were formerly used by the American Indians for food.

AMARAPURA, ŭm'ą-rä-poo'rą, Burma, formerly the capital of the Burmese kingdom, now a suburb of Mandalay. The town was founded in 1783, increased rapidly in size and population, and in 1810 was estimated to contain 170,000 inhabitants. In that year it was destroyed by fire, and this disaster caused a decline in the prosperity of the place. It was finally abandoned as a capital in 1860. The remains of the former palace of the Burmese monarchs still survive. It has a station on the Rangoon-Mandalay Railway. Pop. about 10,000.

AMARI, ą-mä'rē, Michele, Italian orientalist and patriot: b. Palermo 1806; d. Florence 1889. He imbibed liberal principles at an early age, and was an active sympathizer in the various revolutions in Sicily. He came under the suspicion of the authorities and escaped to Paris, where he took an interest in Arabic studies. His translations and editions of Oriental texts, as well as his historical essays, made him a reputation. In 1844 he began his great work, 'La Storia dei Musulmani in Sicilia,' but the revolution of 1848 plunged him into politics once more. On the expulsion of the Bourbons from Sicily he held various public offices. He soon after returned to Paris and resumed his Arabic studies. In 1859 he was appointed professor of Arabic at Pisa and afterward at Florence. He was the pioneer of Arabic studies in modern Italy, and he still remains the standard authority on the Mussulman domination of Sicily.

AMARILLO, Tex., city in Potter County, on the Atchison, Topeka and Santa Fe, the Chicago, Rock Island and Gulf, the Fort Worth and Denver City, the Pecos and Northern Texas and the Southern Kansas and Texas railroads; 32 miles southwest of Panhandle. The city is the centre of a flourishing agricultural and stock-raising section, and has made a rapid growth. Its manufactures are conducted by 36 establishments (U. S. census 1914) employing 429 persons, of whom 311 were wage earners receiving $255,000 in wages. The capital engaged was $1,094,000, and the total output was valued at $986,000; of this, $477,000 was the value added by manufacture. Pop. (1900), 1,440; (1910), 9,957; (1914), 16,000.

AMARNA LETTERS a collection of several hundred cuneiform clay tablets discovered in 1887 at Tel-el-Amarna, a village on the Nile in middle Egypt, on the site of a city built by Amenophis IV. They comprise the correspondence of the Egyptian court about 1400 B.C., and with but three exceptions are in the Babylonian language. Some of them were written by Amenophis III and Amenophis IV and other royal personages contemporary with these, but

the majority are by Egyptian officials and allies in Syria. Their discovery has thrown much light not only on the history of Egypt itself, but upon the condition of the Holy Land prior to the Hebrew invasion. An English translation of the letters, by Metcalfe, with the title 'The Tel-el-Amarna Letters,' appeared in 1896.

AM'ARYL'LIDA'CEÆ, a family of monocotyledonous plants, generally bulbous, sometimes fibrous-rooted. Their characteristics are a highly-colored flower, six stamens and an inferior three-celled ovary. They are natives chiefly of Africa; but species are found in the warmer parts of Europe, in America and tropical Asia, and a few in Australia. To this family belong the snowdrop, the snowflake, the daffodil, the belladonna-lily, the so-called Guernsey lily (probably a native of Japan), the Brunsvigias, the bloodflowers (*Hæmanthus*) of the cape of Good Hope, different species of Narcissus, Amaryllis, Galanthus, Crinum, Agave, Atamasco lily, star-grass, spider lily, etc. The agave and sisal (q.v.) are of considerable commercial value, but the family as a whole is chiefly ornamental.

AMARYLLIS, a genus of bulbous plants of the family *Amaryllidaceæ*. The principal species is *A. belladonna,* the Belladonna lily, of southern Africa, much cultivated for its handsome reddish flowers. The name Amaryllis, however, is most commonly applied by gardeners to species of the nearly related genus *Hippeastrum*. This consists of 60 or 70 species, natives of tropical America. Many of them are widely cultivated as pot plants because of their large and showy flowers which range in color from white to deep red. This group of plants has been greatly improved, particularly in the size and color of the flowers, by hybridization.

AMARYLLIS, the name of a shepherdess in the Theocritean 'Idyls' and the Virgilian 'Eclogues'; also of a character in Spenser's 'Colin Clout's Come Home Again'; of the shepherdess in love with Perigot, in Fletcher's pastoral 'The Faithful Shepherdess'; and of a character in Buckingham's comedy 'The Rehearsal.'

AMASA (more correctly **AMMISHAI**), the nephew of David, King of Israel. He was commander-in-chief of Absalom's rebel army, and after its defeat received from David a promise of the same post in his own army in place of Joab. On the renewal of the revolt under Sheba, Amasa was assigned the task of collecting the men of Judah; as he did not appear when due (perhaps knowing too much about the disturbance), Abishai was sent in his place, and Joab's company took part without commission. Amasa met them at Gibeon, and under pretense of a salute Joab stabbed his cousin and rival (2 Sam. xx, 9).

AMASIA, ą-mä-sē-ą, Asiatic Turkey, a city in the province of Anatolia, 335 miles east of Constantinople, famed as the ancient capital of Pontus and as the birthplace of the historian Strabo. Picturesquely situated in a deep valley, it is built almost entirely of stone and contains a massive citadel and a notably fine mosque. Silk is made here, and salt, wine, wheat and cotton are also exported. Pop. about 30,000.

AMASIS I, Egyptian king, the first monarch of the 18th dynasty. His rule lasted for some 20 years following 1600 B.C. He expelled the Shepherd Kings from Egypt and laid Palestine and Phœnicia under tribute.

AMASIS II, Egyptian king: b. 570; d. 526 B.C. He cultivated friendly relations with the Greeks, and established Greek commerce at Naucratis. Pythagoras and Solon are said to have visited him. He greatly enriched Memphis.

AMATEUR. Up to the middle of the 19th century this now ever-recurring word was used exclusively to define those who for the love of the arts, and not for the profit to be derived from the exercise of them, painted, or engraved, or sang. In such of the recreations and sports as were then in vogue and which some men engaged in for pleasure and others for pay, the phrase used to distinguish the two classes varied. If a man of means rode a horse in a race or a steeplechase for the pure love of equestrianism, while others rode for fees, the one was called a "gentleman rider," and the rest were "jockeys." So again in cricket, those who participated in matches were designated by two titles: "gentlemen," denoting those who participated *con amore,* and "players," those who played for pay. It was always easy to recognize one from the other, for in the list of published names one class was always designated "Mr.," as "Mr. Somerville," while the "players" would lack that prefix and appear as "Thomas Sadler."

Golf of that period was more democratic; neither the word amateur nor any other distinguishment had appeared; cobbler and prince played together, and for stakes too, without a thought of one or the other losing caste. James II, King of England, while still Duke of York, chose an Edinburgh shoemaker as his golfing partner to play two Scotch peers for a goodly stake of money which he and the cobbler won. The Prince did the honorable thing by giving up his half of the stake to the shoemaker, with which and his own share the latter bought a house in the Cripplegate of the city.

The ancient exemption of golf from the distinction between amateur and professional persists even to this day; according to the rules formulated by the United States Golf Association, amateurs may play in contests against professionals, even for a prize, provided only the prize is not cash.

Football at that period was largely in abeyance, except among schoolboys, and the need of definitions had not arisen.

The word amateur in sports first appears in connection with rowing. Up to the year 1835 such rowing contests as had taken place had been on the one hand confined to watermen, who at that time had to serve apprenticeships and could not ply their trade without; and on the other hand to inter-collegiate and inter-university crews. Neither class needed definitions. But at that time an open regatta was organized at Henley, in which it would have been manifestly unjust to allow watermen and others who had had a lifetime's experience and of hardened training to enter and compete against those for whom the regatta was really intended, that is, those who loved aquatic sport for its own sake and followed it only as a

recreation at seasonable times. Hence rules were formulated and have ever since been in operation which distinguished the professional from the amateur and precluded the possibility of the one contesting against the other. So strong is this feeling still in rowing at Henley that in 1902 a further restriction was made against the entry of any crew that had within a month from its entry been trained by a professional.

When track athletics, about 1850, first crystallized by the impulse given it by colleges and clubs, similar conditions existed. The only representative of this form of recreation at that time was the old and hardened trotter-around-the-track, sometimes for the gate money derived from it, sometimes for the benefit of the betting men. Ostensibly it would have been unfair to handicap young collegians by permitting their intermingling, even if for ethical reasons it had not been desirable. Rules were here again formulated which had the effect of barring the professional and defining the amateur. The rule of the Amateur Athletic Association of Great Britain may be quoted as expressing the then prevalent feeling:

"An amateur is one who has never competed for a money prize or staked bet, or with or against a professional for any prize, or who has never taught, pursued or assisted in the practice of athletic exercises as a means of earning a livelihood."

Football added another temptation on account of its possibilities in city centres of attracting large numbers and much gate money. Here, too, the barrier was raised, in both the association and the Rugby games, along lines which America has followed. But the United States authorities in all recreations have gone a great deal farther in the strictness of their definition of the word amateur, and in safeguarding against persons who receive any portion of their traveling or hotel expenses: a notable example of this occurred in 1902, when the National Golf Association precluded from the amateur ranks any player who participated in the generosity of railroad companies or hotel proprietors.

A more recent illustration of this tendency in the world of American athletics was the case of James Thorpe, the Indian student from Carlisle, who won the all-round championship in the international Olympic Games at Stockholm in 1912. Some months later a statement was published in some obscure paper that the young Indian had been a paid member of a baseball team in North Carolina some two or three years previously. Thorpe frankly admitted this to be the truth, whereupon the American Olympic Committee and the Amateur Athletic Union repudiated Thorpe as an American amateur athlete, contending that he had no right to the honors he had won. Thorpe returned his trophies and has since become a professional baseball player.

It would seem an easy thing, from the foregoing facts, to be able to formulate a phrase which should generically and yet accurately describe an amateur, but it is not, as the story of the endless definitions adopted and abandoned, or amended, though made by experts, attests.

The spirit is the old spirit «for the love of the art or game and not for personal gain»; even if a present literal definition were attempted, it might be rendered obsolete by new legislation in a short time. Those who are purposing to enter any particular recreative contest in which the status of the amateur is material must consult the last rules of the organization governing it.

AMATEUR THEATRICALS. Amateur theatricals have had a long and distinguished history. In the beginnings of art, in the primitive history of humanity, all artists were necessarily amateurs. The renowned tragedians and comedians of Athens were amateurs. Amateurs created the mystery and morality plays of mediæval times and ushered in the modern theatre of Shakespeare and Moliere, Racine and Calderon. The marvelously popular Roman farces, the Atellanæ, which augmented the theatre with types that exist to this day, came from the country players of Atella (see ATELLANÆ). Recent researches suggest that amateurs founded the famous Commedia Dell' Arte of Italy (see HARLEQUINADE). In late years amateurs, true to their lineage, labored to bring forth the *Théâtre Libre* of Paris, the *Irish Literary Theatre* of Dublin, the *Art Theatre* of Moscow, and many others in Europe similar to these world-approved experiments. In New York a group of young artists called the Washington Square Players, with little or no professional experience, have performed with noteworthy success a number of excellent one-act plays that would most probably have remained outside the commercial theatres. Mæterlinck, Tchekoff and Bracco were among their authors; but the two most pronounced successes were by local writers. These facts present but surface evidence of the stir going on in and around the theatres all the world over; and often enough, in places that never before had known of a theatre. A new age, quite unparalleled in history, has begun for amateur theatricals. Never before have so many sides of the art received equal attention and sustained so many possibilities; never before have so many accomplished virtuosi in every country in the world concerned themselves with the theory and practice of the theatre. The actor for the moment has been displaced from his old strategic position, and the *regisseur*, with all the reins of all the arts in hand, wields the sway. Books on the drama and the theatre are issued by the million. Literary and debating societies find in the drama the dominant topic. Drama clubs flourish everywhere. The Drama League of America has given a powerful impetus to thousands of these clubs and societies. This organization, with headquarters in Chicago and New York, and with producing or non-producing centres in nearly every State, and in Toronto and Ottawa, makes the publication and distribution of dramatic material of all kinds (plays, bulletins of current plays, sectional play lists, book lists, a quarterly *Review*, a monthly bulletin, etc.), the maintenance of inquiry bureaus and the booking of lecture courses, the chief means for educating the public. The institution is unique in history, and is the literary centre of the major part of amateur dramatic performance and discussion in the United States.

It would seem that to-day even the most conservative bodies, hitherto strongly opposed to it from various standpoints, have undergone

a complete change of front with regard to the theatre. In the energetic realization by so many educationists of the breadth and depth of the dramatic instinct, and of ways and means of profitably utilizing this love of play-making and play-going, both within the school and beyond, we see other signs of the renaissance of amateur dramatics. The colleges and universities have awakened to the need of encouraging a broader theatre than the higher institutes of learning have yet known (see COLLEGE DRAMATICS). In many elementary schools in Europe and the United States, history, geography and language are being taught through the dramatic method; and in nearly all schools it is becoming the custom to early instil a feeling for literature and the higher morality by the aid of selected drama. Producing societies — some of them bringing pronounced individuality to the work, with the shrewdest skill and artistic wit — have sprung up everywhere. And, despite the almost inevitable crudeness in some directions, and not a little audacity, valuable contributions are being made to the future of the professional theatre. Artists of many phases outside the direct lines of the theatre are practising the technique of the theatre as an adjunct to their own, and as an impetus to development. Social, civic and rural officials are doing likewise. The Neighborhood Theatre of Grand Street on the east side of New York city, founded and financed by the Misses Lewisohn, introduced mechanical features new to the American stage, and has struck an individual note. The Provincetown Players, founded by writers and printers of Washington Square district of New York, have been accorded highest praise by professional critics in reviews of the season's work. The Hull House Players, under the enthusiasm of Miss Addams, prompt to note the power that lay in the cultivation of the dramatic instinct, received much attention from the whole continent, widened the scope of the Settlement, and were recently enabled to take a trip to Europe on the proceeds of special performances. The Little Theatre of Chicago, sustained by a wealthy social set, and famous for its simple staging; Mrs. Gale's Toy Theatre of Boston (which introduced a scenic artist of rare gift to the professional stage); the Forest Lake Players under Mr. and Mrs. Aldis; the Wisconsin Players (who have given a season in New York); the Carnegie School of Applied Design in Pittsburgh, directed by Prof. T. Ward Stevens (himself an artist and dramatist), the experimental theatres of Philadelphia and Milwaukee, have all been distinguished by the striking taste and originality of their productions. "The Bohemian Jinks" of the Bohemian Club of San Francisco (somewhat more serious performances than the title would imply), played among the redwood pines, have slowly evolved since the seventies, and are characteristic of open-air experiments conducted by men of distinguished parts to whom the theatre is an avocation. The community theatres, including festivals and pageants, rural theatres and children's theatres, are all signs of the times and are treated at length under special headings.

Not the least important side to amateur acting is the opportunity it gives the aspirant for receiving the basis of his art education. It also enables him to try his wings preparatory to undergoing the severer discipline of the professional stage, under directors with firm preconceptions in regard to parts. And the actor is jealous of his individuality. It is the glory of the actor, both professional and amateur, that he is the medium for re-creating, in the most vivid and popular art form, the spirit of all literature as expressed by dramatists during all ages. And it is his fortune, that in the space of a few years, since the beginning of the 19th century, the market has become stocked with a choice of excellent plays of all kinds, excepting the poetic.

The labors of the actor are in themselves a liberal education. First, the pursuit of such graces as elocution, gesticulation, deportment, music, dancing, fencing, with the best possible teachers; then practice, practice and again practice. Given earnestness, the capacity for taking pains, the student will not be discouraged if nature has not endowed him with all the gifts for all the arts within the art. No artist ever lived who possessed all the advantages appointed to fit out the youthful paragon who abides in most handbooks to amateur theatricals — and nowhere else. For those who live in the big cities, schools like Madame Alberti's, the American Academy of Dramatic Art, in New York, and institutions of the credit of the School of Expression, Cincinnati, offer sound training in technique. But the young actor, warding off the danger of becoming merely mechanical that haunts every artist, must break away from all teachers and familiar counsellors to experiment with all manner of parts — preferably before the responsive audiences to be met in social and recreative centres. Then, as a necessity of his existence, he should cultivate the observation of the world around for all that is characteristic. A knowledge of physiognomy will be of incalculable help in the study of human character; and no better beginning could be made in this direction than with one of the works of Dr. Katharine Blackford, the industrial employment adviser, co-author of 'The Man, the Job, the Boss.' The works of Lavater, illustrated with excellent line drawings for make-up; Darwin's 'Expression of the Emotions in Man and Animals,' and Mantegazza's 'Physiognomy and Expression,' all advance this study. George Henry Lewes' 'On Actors and the Art of Acting,' and the monographs by Denis Diderot, the great encyclopedist, and by Talma, the tragedian, are the profoundest of all the many works on the psychology of acting. The reprints of various papers written by famous actors and published by the Columbia University Dramatic Museum are interesting and instructive material. For views of the methods employed in training the students of the Paris Conservatoire consult J. R. Solly's 'Acting and the Art of Speech at the Paris Conservatoire' (London 1891), and Austin Fryer's 'Guide to the Stage' (London 1905). It should be remembered that the actor is at one and the same time the composer of a musical score (that has no notation) and its interpreter, as well as a living, moving sculptor, fitting into a kaleidoscopic group of other such sculptors and musicians — trumpeters of literature, be it good or bad. Only by a regard for these facts can histrionic development pro-

ceed. For literary aids to technical excellence, and for notes on all property and other requirements, the selected bibliography below should be closely read. But the student of theatre art cannot too clearly become acquainted with the fact that the intricacies and niceties (of "making-up" for example) can never be acquired from any book.

Plays for Amateurs.—"The Agency for Unpublished Plays," Concord avenue, Cambridge, Mass., has many new American plays in MS.; Baker, W. H., & Co., Boston, Mass., circulate lists of plays of all publishers, many of these plays being royalty-free; Browne, H. B., 'Short Plays from Dickens, for the use of amateur and school dramatic societies' (London 1908); Clapp, J. M., 'Plays for Amateurs' (Chicago 1915. A Drama League publication contains detailed descriptions of 197 plays; all but 59 being one-act. The notes on choosing a play and the hints on production are excellent); Denison, T. S., 'Descriptive Catalogue of Amateur and Standard Plays' (Chicago); Dick, John, 'List of 1,000 Standard Plays' (Reynold's Newspaper Company, London. Valuable for a choice of royalty-free plays. Includes adaptations of the novels of Dickens, Scott, Charles Reade, Hugo and many other standard novelists, though it may be necessary to readapt much of the old-fashioned dialogue. All at two cents each); Dickinson, T. H., 'Chief Contemporary Dramatists' (New York 1915, 21 complete plays in one volume); *Dramatic Index* (Boston; invaluable though not yet well known, published quarterly from 1909); Dutton's 'Everyman Library' includes many volumes of translations of foreign plays, royalty-free (New York); Filippi, Rosina, 'Sixpenny Series of Adaptations of the Novels of Jane Austin' (London 1901, by the famous London actress and amateur coach); French, Samuel, 'The World's Best Plays' (New York 1916, edited by Mr. Barrett H. Clark of the Drama League, with notes and suggestions for staging; about 50 titles, many new); 'Guide and Index to Plays for Amateurs' (New York); McFadden, E. A., and Davis, L. E., 'A Selected List of Plays for Amateurs' (350 titles, with descriptive details, appendices of outdoor plays and of Old English and standard plays, Cincinnati 1908); Matthews, Brander, 'The Chief European Dramatists' (21 plays from the drama of Greece, Rome, Spain, France, Italy, Germany, Denmark and Norway, from 500 B.C. to 1879 A.D.; selected and edited with notes, biographies and bibliographies, Boston 1916); Moses, M. J., 'A Collection of American Plays' (New York 1916, one of the latest volumes in the 'Everyman Library' series); 'Sixpenny Carpet Plays' (London, edited by Lucian Oldershaw, sometime secretary of the Oxford University Dramatic Society); Pierce, J. A., 'The Masterpieces of Modern Drama; English, American and Foreign: abridged in narrative, with a critical essay by Prof. Brander Matthews' (2 vols., New York 1916); 'Washington Square Plays' (New York 1916); Short plays and monologues for amateurs (a bibliography; Carnegie Library *Monthly Bulletin*, Pittsburgh 1908); 'Actable One-Act Plays' (by the officials of the Chicago Public Library, March 1916); 'Plays of Thirteen Countries' (by the officials of the New York Public Library, 1915. These two lists are more literary than dramatic in their bias). The play brokers publish lists of the latest plays; consult the 'New York *Dramatic Mirror* Date Book' and the Drama League 'Plays for Amateurs' for a list of play brokers. Translations of the best foreign plays are to be found in the important dramatic reviews, *The Drama Quarterly*, *The Dramatist* and *Poet Lore*.

Copyright.—The copyright laws of the United States are somewhat stricter and narrower than similar laws in Europe; for no performance of a copyright play may be given without permission, even where the performances are free to the public. It should be observed that until we have a uniform copyright law all British plays may be publicly performed without a permit, even in the United Kingdom, if there be no charge for public admission. Needless to say, if any British play be duly copyrighted in the United States, the domestic law applies. The title page, or the page that immediately follows, will have one of the three necessary imprints of copyright if the work be copyrighted in form. Should there be any doubt in regard to registration, reference may be made to the catalogue of all such copyrighted works on file at the public libraries; or, the question may be directly put to the Register of Copyrights, Washington, D. C., who will gladly extend the required information. Any infringement of copyright by performers may lead to damages.

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'The Play of To-Day' (New York 1913); Mackay, Constance D'Arcy, 'Costume and Scenery for Amateurs; a practical working handbook' (New York 1915; best work of the kind for amateurs; contains numerous costume, scene and property plates, drawn conventionally as a basis for experimentation, with directions for procuring and making all requirements, in accord with the new stage art); Mackaye, Percy, 'The Playhouse and the Play' (New York 1909); Morton, Cavendish, 'The Art of Theatrical Make-up' (London; the one book on the subject of any art value; splendidly illustrated); Neil, C. L., 'Amateur Theatricals' (London 1904); Taylor, Emerson, 'Practical Stage Directions for Amateurs' (New York 1916 conventional compilation); Thalasso, A., 'Le Théâtre Libre, 1887–96' (Paris 1906); Young, James, 'Making-up' (New York 1905). *Periodicals.—The Drama Quarterly* (Chicago); *The Dramatic Index* (Boston); *The Dramatic Mirror* (New York); *The Dramatist* (Easton, Pa.); *Poet Lore* (Boston). See COMMUNITY THEATRES; CHILDREN'S THEATRES; COLLEGE DRAMATICS; COSTUME; DRAMA; SCENE-PAINTING; STAGE and THEATRE.

DUNCAN MACDOUGALL.

AMATI, ą-mä'tē, an Italian family of Cremona, celebrated for their skill in making violins. ANDREA AMATI (b. about 1520; d. 1570) was the earliest member to follow the art, but few of his instruments remain. His younger brother, NICOLA, made basses. Andrea's sons, ANTONIO (b. about 1555) and GERONIMO (b. 1556; d. 1630), worked after their father's manner, but Geronimo's son NICOLO (b. 3 Dec. 1596; d. 12 Aug. 1684) excelled all others of his family, and in his hands the art of the Cremonese school reached its perfection. His most famous pupils were Antonio Stradivarius and Guarnari. The line ended with his son GERONIMO, whose violins were of inferior quality.

AMATITLÁN, ą-mä'tē-tlän, or **SAN JUAN DE AMATITLÁN,** a Central American town in the republic of Guatemala, 12 miles southwest of Guatemala City. In its vicinity are found hot springs and salt and alum wells. It stands on the shores of Lake Amatitlán, and the department of which it is the capital bears the same name. The chief industries of the people of this region are the gathering of cochineal, the preparation of salt and raw silk and the cultivation of fruits. The town was severely damaged by earthquakes in 1902. Its population is given as 12,000. The entire department has about 38,000 inhabitants. See GUATEMALA.

AM'AURO'SIS, a disease of the retina or its nervous connections, resulting in partial or complete blindness. It usually begins with confused vision; there may then be the appearance of a black spot in the centre of an object looked at, and graded dimness of sight develops. See AMBLYOPIA.

AMAURY I, ą'mō'rē, King of Jerusalem: b. 1135; d. 11 July 1173. He was the son of Baldwin II, and reigned from 1168 to 1173, in succession to his brother, Baldwin III.

AMAURY II, sometimes known as **AMAURY DE LUSIGNAN,** titular King of Jerusalem: b. 1144; d. Acre 1205. He was King of Cyprus 1194–1205, succeeding his better known brother, Guy de Lusignan.

AMAXICHI, ä'mäks-ē'kē, or **LEVKAS,** Greek town, the capital of Santa Maura, or Leucadia, one of the Ionian Islands. A Greek archbishop resides here. It is on the east coast of the island and possesses a small harbor. Pop. 6,000.

AMAZI'AH, King of Judah about 797–779 B.C.; son of Joash. He punished his father's murderers and reconquered the Edomites; but according to 2 Kings xiv was so puffed up by his victory over these Bedouin that he challenged Joash, King of Israel, an incomparably more powerful, civilized foe, to a war. Joash retorted with stinging contempt, wishing to avoid the contest, but Amaziah insisted, and Joash routed his army and captured him, stormed and sacked Jerusalem, destroyed a part of the wall, and carried away to his capital of Samaria hostages, and a large amount of spoil, including gold and silver treasure and temple utensils. Amaziah, after his release and 15 years further of reign, was killed by conspirators at Lachish (2 Kings xiv, 19).

AMAZON, the chief river of South America and the greatest in all the world. Its source is found in the Peruvian Andes, its headwaters, the Marañon and Ucayale rivers, uniting in about long. 74° W. From long. 70° its course is wholly in Brazil, and its entire course from the source of the Ucayle to its mouth is about 3,400 miles, its width increasing from over a mile at the Peruvian frontier to 150 miles. The Amazon receives the waters of about 200 tributaries, 100 of which are navigable, and 17 of them 1,000 to 2,300 miles in length. From the north it receives the Santiago, Morona, Pastaza, Tigre, Napo, Putumayo, Japura, Rio Negro (a branch of which, the Cassiquiare, strangely enough connects it with the Orinoco), Uatama, Trombetas, etc.; from the south the Huallaga, Ucayale, Yavari, Jutahy, Juruá, Teffé, Coary, Purus, Madeira, Tapajos, Xingu, etc. The depth varies much. From the sea to the mouth of the Rio Negro, about 750 miles in a straight line, the depth is nowhere less than 30 fathoms; higher up it varies from 10 to 12, and up to the junction of the Ucayale there is depth sufficient for large vessels. The rapidity of the stream is considerable, especially during the rainy season (January to June), when it is subject to great floods. It is on the average two and three-fourths miles per hour. In some places it is four, or even more, and in others as low as one mile. The river is perceptibly affected by the tides up as far as the town of Obidos, 400 miles from its mouth. The phenomenon of the *bore,* or as it is called on the Amazon the *pororóca,* occurs at the mouth of the river at spring tides on a grand scale. The waters of the ocean rush into the river in the form of huge waves 10 to 15 feet in perpendicular height, three or four of which follow each other with irresistible force. The waters of the Amazon swarm with alligators, turtles and a great variety of fish, of which Agassiz in 1866–67 discovered 1,163 species. The country through which it flows is covered with immense and impenetrable forests, and in regions at a distance from the larger water-courses the scarcity of mammalia bears silent testimony to

the triumph of vegetation and the subordination of the animal kingdom. The area drained by the Amazon and its tributaries is estimated at 2,600,000 square miles. This region produces an immense variety of vegetable substances, including a great many drugs, dyewoods and valuable timber trees. The products it might be made to yield by cultivation are almost innumerable, among the chief being cotton, sugar, indigo, coffee, cocoa and tobacco. The Amazonian water system affords some 16,000 miles of river suitable for navigation. Steamers began to ply on the river in 1853, but years passed before its navigation was opened up to all nations. Pará is the chief seat of the trade on the river, and Manáos, situated about 1,000 miles up, is also a place of commercial importance. About 40 river, coasting, and ocean steamers now ply regularly between Pará and Manáos every month, a number of them being British.

Mr. Lange (see *Bibliography*) describes the *pororóca,* saying that in certain places "the wave travels fast,—it has traveled a measured statute mile in 90 seconds, or at the rate of about 45 miles an hour." Ex-President Roosevelt (see *Bibliography*), describing "the mightiest river in the world, the Amazon," says: "It runs from west to east, from the sunset to the sunrise, from the Andes to the Atlantic. The main stream flows almost along the equator. This gigantic equatorial river basin is filled with an immense forest, the largest in the world, with which no other forests can be compared save those of Western Africa and Malaysia. We were within the southern boundary of this great equatorial forest, on a river which was not merely unknown but unguessed at, no geographer having ever suspected its existence. This river flowed northward toward the equator, but whither it would go, whether it would turn one way or another, the length of its course, where it would come out, the character of the stream itself, and the character of the dwellers along its banks—all these things were yet to be discovered." Again, on pp. 333 and 334, we read: "We finally entered the wonderful Amazon itself, the mighty river which contains one-tenth of all the running water of the globe. It was miles across, where we entered it; and indeed we could not tell whether the farther bank, which we saw, was that of the mainland or an island. We went up it until about midnight, then steamed up the Rio Negro for a short distance, and at one in the morning reached Manáos. Manáos is a remarkable city. It is only three degrees south of the equator. Sixty years ago it was a nameless little collection of hovels, tenanted by a few Indians and a few of the poorest class of Brazilian peasants. Now it is a big, handsome modern city, with opera-house, tramways, good hotels, fine square and public buildings and attractive private houses. The brilliant coloring and odd architecture give the place a very foreign and attractive flavor. Its rapid growth to prosperity was due to the rubber-trade. This is now far less remunerative than formerly. It will undoubtedly in some degree recover; and in any event the development of the immensely rich and fertile Amazonian Valley is sure to go on, and it will be immensely quickened when closer connections are made with the Brazilian highland country lying south of it."

The mouth of the Amazon was discovered by Yañez Pinzon in 1500, but the stream was not navigated by any European till 1540, when Francis Orellana descended it. Explorations of the river or portions of it were undertaken in later times by La Condamine (1743–44), Humboldt (1799), Prince Adalbert of Prussia (1842), Herndon (1850), Lallemant (1858), Bates (1861), Marcoy (1866), Agassiz (1866–67) and others; and of its tributaries by Hartte, Chandless, Abendroth, etc. See also in the following list of books the names of other distinguished travelers.

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AMAZONAS, ä'mą-zō'nas, Brazil, the largest of all the Brazilian States and the farthest north: bounded north by British Guiana and Venezuela; east by the State of Pará; south by Bolivia and the State of Matto Grosso; west by Colombia and Peru. Its area is 732,439 square miles, or nearly three and a half times that of France, and except for mountain ranges on the Venezuelan border it is an alluvial plain. Its capital is Manáos. Pop. of the State 387,000. The name Amazonas is also borne by a territory of Venezuela and a department of Peru (q.v.).

AMAZONAS, Peru, a department in the montaña portion of the republic, has an estimated area of 13,940 square miles. It is bounded on the north by Ecuador, on the northeast and east by Loreto, on the south by La Libertad and on the west by Cajamarca. In this department we find mountains of the central Cordillera intersected by the deep valleys of the Marañon and its tributaries. A singular fact in regard to these tributaries is that two of them, flowing in opposite directions, bear the same familiar name, Santiago. The departmental capital is Chachapoyas, seat of a bishopric, and the industrial centre of a department which is still in large measure covered by virgin forests. The products, beside the rubber, coca, etc.—the usual products of the forest—are cacao, coffee, sugar, cotton, tobacco (in those

deep valleys), and, in mining sections, rock salt and gold. The inhabitants numbered, in 1916, about 53,000.

AMAZONAS, Venezuela, a territory of the republic, bounded on the north and east by the State of Bolivar, on the south by Brazil and on the west by Colombia. It is divided into two main parts by the Orinoco River, and the western part includes great llanos which extend to the neighboring republic of Colombia. There are navigable rivers, such as the Orinoco, the Meta, the Ventuario, the Guaviare, the Vichada and the Iriuda. The chief products are rubber, copaiba, sarsaparilla and wild cacao. Pop. (est.) 46,000, divided as follows: 12,000 Indian converts, 33,000 savages, 200 natives of other States of the republic and 700 foreigners. The capital is San Fernando de Atabapo. See VENEZUELA.

AMAZONS, in Greek legends a nation of female warriors. They were fabled to have cut off their right breasts in order not to interfere with their use of the bow, and variously to have expelled men from their country or kept them in subjection for the continuance of the race. The earliest traditions locate them in Asia Minor and relate their appearance at the siege of Troy under their Queen, Penthesilea.

AMAZONSTONE, a beautiful green or blue feldspar. It is a variety of the mineral microcline and occurs in magnificent crystals in granite near Pike's Peak, Col. Inferior crystals occur in New Jersey, the Ural Mountains and many other localities. Large quantities of green, cleavable amazonstone have been obtained at Amelia, Va., and have been worked up as semi-precious and decorative stones.

AMBALA, or **UMBALLA**, the name of a district of Northern India and its capital. The latter was the scene of a treaty between the governor-general of India, Lord Mayo, and the Emir Shere Ali of Afghanistan in 1869. The town contains several important churches, a dispensary, hospital and a leper asylum. Pop. 80,000.

AMBALENIA, Columbia, city in the department of Tolima, on the Magdalena River, 50 miles west of Bogota. It is the trade centre of a rich agricultural region, exporting large quantities of excellent tobacco. Pop. 8,500.

AMBARI, ąm-bä'rē, **HEMP**. See HIBISCUS.

AMBARV'ALIA, Roman festival in honor of Ceres, which was observed in May. The blessing of the goddess was then besought on the wished-for harvest.

AMBASSADOR (from the mediæval Latin *Ambasciator*, an agent), diplomatic officer of the highest rank, the representative of one nation at the court of another. In this capacity he is expected to support the interests and dignity of his own state. Ambassadors are ordinary when they reside permanently at a foreign court, or extraordinary when sent on a special occasion. When ambassadors-extraordinary are vested with full powers, as of concluding peace, making treaties and the like, they are called plenipotentiaries. Ambassadors are often loosely styled ministers. Envoys are ministers employed on special occasions, and are of less dignity than ambassadors. Until 1893 the United States had been represented at foreign courts by persons with the rank of ministers-resident, accredited in the care of the great powers as envoys-extraordinary and ministers-plenipotentiary. In that year, however, an act of Congress was passed allowing the President to accredit ambassadors as United States representatives at several of the more important European courts. When acknowledged as such, ambassadors are exempted absolutely from all allegiance and from all responsibility to the laws of the country to which accredited. Should they be so regardless of their duty, however, and of the object of their privilege, as to insult or openly to attack the laws of the government, their functions may be suspended by a refusal to treat with them, or application can be made to their own sovereign for their recall; or they may be dismissed and required to depart within a reasonable time. An ambassador is considered as if he were out of the territory of the foreign power, by fiction of law, and it is an implied agreement among nations that the ambassador, while he resides in the foreign state, shall be considered as a member of his own country, and the government has exclusive cognizance of his conduct and control of his person. Ambassadors' children born abroad are held not to be aliens (7 Coke, 18 *a*). The persons of ambassadors and their domestic servants are exempt from arrest on civil process (3 Burr. 401, 1731).

AMBASSADORS, The. 'The Ambassadors' is often spoken of as enjoying the doubtful distinction of being the most talked about and least read novel in the English language. It holds first place in the affection of most people with whom the love of Henry James is a literary cult; it is the author's own favorite among his works. He calls it «quite the best 'all round' of all my productions.» Yet, in spite of the fact that it was published in 1903, 25 years after 'Daisy Miller' and 'The Portrait of a Lady' had created an audience for their author's work, half of the first edition remained on the publisher's shelves for years. It requires something more than the fact that 'The Ambassadors' is written in James' «later manner» and is full of subleties of character, situation and expression to account for these extremes of admiration and neglect, and that something is undoubtedly the age of the hero. Middle age has never been popular in fiction, and 'The Ambassadors,' through Lambert Strether — probably the finest character James ever created — is the mirror of New England middle age beside the youth of Paris. The essence of the story, according to Henry James' preface to the New York edition (the best analysis of the work), is contained in the words of Strether to the friend of the New England boy whom he has been sent to save from the clutches of Paris and whom he finds «disobligingly and bewilderingly not lost.» «Live all you can; it's a mistake not to. It doesn't so much matter what you do in particular so long as you have your life. If you haven't had that, what have you had?»

EDITH J. R. ISAACS.

AMBATO, Ecuador, town on the slope of Chimborazo, 70 miles south of Quito. It has a flourishing trade in grain, sugar and cochineal. Pop. 12,000.

AMBER, one of the most important and valuable of the fossil resins. It is one of the oxygenated hydrocarbons and its mineralogical name, succinite, emphasizes one of its distinguishing characteristics, namely, the presence of from 5 to 8 per cent of succinic acid. Its composition is represented by the formula $C_{40}H_{64}O_4$. It occurs in irregular masses, usually of small size but sometimes weighing up to 15 or 18 pounds. It has a yellow color, resinous lustre and conchoidal fracture. Its hardness is 2 to 2.5 and specific gravity 1.05 to 1.1. Along the shores of the Baltic Sea, especially in East Prussia, mining for amber has been carried on for two centuries. In this region shafts are sunk through a superficial stratum of marl and sand, a bed of lignite with light sands and gray clays, and finally a layer of green-sand, 50 to 60 feet thick. All of these strata contain amber, but in the lower portion of the green-sand there is a stratum four to five feet thick of "blue earth" in which amber nodules occur so abundantly that 50 or 60 square rods yield several thousand pounds. This "blue earth" stratum extends out under the sea and there the amber is freed and cast upon the shores by the waves, especially after the autumnal storms. Small quantities are found in Great Britain, on the coasts of Sicily and the Adriatic, in various parts of Europe, in Siberia, Greenland and in the United States.

Pliny declared amber to be "an exudation from trees of the pine family," a conjecture that proves to be correct. The fact that it was at one time fluid or nearly so is established by its occasional inclusion of insects; and its antiquity is also established by the fact that most of the species of insects so included are now extinct.

Amber becomes strongly electrified when rubbed, and the power that it then possesses, of attracting light bodies to itself, was probably considered by the ancients to be the outward sign of the mysterious virtues that they attributed to the mineral. It was greatly esteemed for ornaments and charms, and Pliny says that among women "it had been so highly valued as an object of luxury that a very diminutive human effigy, made of amber, had been known to sell at a higher price than living men, even in stout and vigorous health." He also says that a necklace of amber beads was considered to protect the wearer from secret poisons, and to be efficacious as a counter-charm against sorceries and witchcraft. In the time of Nero an expedition sent from Rome to the Prussian amber-beds returned with 13,000 pounds of the precious substance.

In modern times amber is chiefly used for the manufacture of mouthpieces for tobacco pipes and for the preparation of a kind of varnish. The attractive power exhibited by amber when rubbed was the first electrical phenomenon observed by man, and the word "electricity" was derived from electrum, the Greek name for amber.

AMBER, India, a ruined city, the ancient capital of Jaipur. Its picturesque situation at the mouth of a rocky mountain gorge, in which nestles a lovely lake, has attracted the admiration of all travelers. It is now only remarkable for its architecture. The chief building is the Diwan-i-Khas built by Mirza Raja, the columns of which were covered with stucco to hide their magnificence from the commissioners of Jehangir, who had ordered it destroyed because it surpassed the marvels of his imperial city of Agra. It is only by knocking off some of the plaster that one can get a glimpse of the sculptures, which are as perfect as on the day they were carved.

AMBER-FISH, any one of a genus of fishes (*Seriola*) related to the pilot-fishes, many species of which are found along our coasts, the most of which are known by other names. The great amber-fish, or amber-jack, is a food-fish of some importance in the Gulf of Mexico and the West Indies, reaching a weight of 100 pounds. Others in that region are more commonly known as madregals; and a species of the Pacific Coast is the highly-prized yellow-tail (q.v.). The name refers to the prevailing color.

AMBER GODS, The, a story by Harriet Prescott Spofford, published 1863. It is characterized by superb depth and richness of color, like a painting by Titian. An amber amulet or rosary possessing mysterious influences gives the title to the story.

AMBER INSECTS. The great majority of the fossil insects of the Oligocene (Tertiary) period have been obtained from the amber of the Baltic shores of Prussia, upon which they had rested in life, stuck fast and then been overflowed. The most fragile and delicate flies, moths and many other insects, besides spiders, mites, centipedes and crustacea, are preserved in this gum or resin, which was evidently formed in the same manner as gum copal, also a late tertiary or quaternary gum.

AMBERG, the ancient Bavarian capital of the upper Palatinate, situated on both sides of the Vils, in the midst of numerous iron-works. It is well built, and on the site of its former walls are shaded walks. Glass, iron wares, stoneware, tobacco, beer, vinegar and arms of good quality are manufactured here. The principal buildings are a Gothic church of the 15th century, the royal palace, the town-house and the Old Jesuits' College, and it possesses a gymnasium and a large library. At Amberg the Archduke Charles defeated the French general, Jourdan, on 24 Aug. 1796. Pop. 25,000.

AMBERGRIS, a gum-like substance of great value in the making of perfumes, obtained from the intestinal canal of the sperm whale, or found floating in pieces of various sizes on the surface of the sea. It is a product of cetacean digestion, and often contains the beaks of cuttle-fish, a fact which conclusively proves the place of its origin, until recently much in doubt. When first extracted from the alimentary canal it has the feeling and consistency of thick grease, and chemically seems to be of the nature of cholesterin, but after exposure to the air hardens and acquires its characteristic sweet earthy odor. Some odd stories were told by the old writers to account for its origin, of which the least absurd was that it was the excrement of the whale. It was held by the ancients to be of great value in certain diseases, but is now used entirely in connection with perfumery, and is worth about $20 a pound. The name is also given to a bar-

ren island on the coast of Yucatan, on account of the quantities of ambergris gathered along its shores.

AMBIDEXTERITY, the ability to use the right or left hand with equal freedom and skill in all types of manipulation. The causes of the condition of right-handedness, i.e., the tendency to use the right hand only for finer manipulations, are probably to be found in inherited nervous structures which in turn seem to be related very closely to the inherited circulatory organs. Exercise may have some effect in fixing this relation and exaggerating the degree of one-sided development, but it is generally agreed that the inherited structures are of first importance.

AMBIGUITY, in law, the uncertainty of meaning of words, clauses or other parts of a written instrument. The rule of evidence preventing the admission of hearsay evidence has the important exception that it may be admitted to explain an ambiguity in a written instrument. See CONTRACT; EVIDENCE; WILL; and consult the works referred to under these subjects.

AMBITIOUS WOMAN, An, a novel by Edgar Fawcett (1883). It is a keen yet sympathetic analysis of an American female type whose dominant trait is social ambition. Claire Twining is reared in the ugly poverty of a Brooklyn suburb, but is clever and capable, with strong aspirations for the luxuries of life. Through the good offices of a schoolmate she gains a social foothold. If Claire's transformation seems a little sudden, there is genuine strength in the story and much truthful observation of city life in New York.

AMBLER, James Markham Marshall, surgeon and Arctic explorer: b. Virginia, 30 Dec. 1848; d. in the Lena Delta, Siberia, 31 Oct. 1881. Educated at Washington and Lee University and the Medical College of the University of Maryland, he practised medicine in Baltimore 1870–74; entered the navy as assistant surgeon 1874; and was selected as volunteer for that post to the Jeannette Arctic expedition under George W. De Long, 1879. When their vessel sank, 13 June 1881, he accompanied his chief along the Lena and was alive at the date of the last entry in De Long's journal, 30 Oct. 1881, but probably died the following day. His remains were discovered by Chief Engineer Melville, 23 March 1882. Upon his body were found memoranda on 'Ice Formed by Sea Water' and 'Remarks on Snow Crystals,' published in De Long's 'Journal' (Boston 1883).

AMBLER, Pa., borough in Montgomery County, 15 miles northwest of Philadelphia, on the Philadelphia and Reading Railroad. The Methodist Episcopal church here is famed for its stained-glass windows. Fort Washington and the home of Gen. George Meade are of historic interest. The borough contains a chemical factory, also asbestos, shingle, slate and sheet metal works. It is a favorite summer resort for residents of Philadelphia. It has large agricultural interests. Pop. 4,000.

AMBLESIDE, England, town in the English lake district, Westmoreland, the home of Harriet Martineau, and near which Wordsworth and Dr. Arnold resided. The chief industry is the manufacture of coarse woolen goods. Pop. about 2,500.

AMBLETEUSE, äṅ'bl'-tĕz, French village on the English Channel six miles north of Boulogne, noted as the landing-place of James II on his flight from England 1689. In 1805 Napoleon erected a monument here to the Grand Army. Pop. about 700.

AMBLYDACTYLA. See AMBLYPODA.

AMBLYGONITE, am-blig'ō-nīt (from the Greek *amblygonios*, "obtuse-angled,") a mineral crystallizing in the triclinic system, and having the chemical formula $AlPO_4.LiF$. The lithium is often partially replaced by sodium, and the fluorin by hydroxyl (OH). Its hardness is 6 and its specific gravity about 3.05. It is translucent and white, or more or less tinged with various colors. It occurs in certain localities in Saxony, Norway, France and Peru; and in the United States it has been found in Maine and Connecticut. It is a valuable lithia ore.

AM'BLYO'PIA, defective, weak or blunted vision, a word now widely employed instead of the term amaurosis, meaning blindness (q.v.), since the modern methods of examination of the retina have made known the more exact character of the affections of this part of the eye. Defective, weak or blunted vision due to disorder of the retina usually may be attributed to the following main causes: (1) Certain poisons, notably alcohol, wood alcohol in particular, tobacco, lead and uræmic poisoning of Bright's disease; (2) certain functional or reflex disturbances, as in hysteria; (3) changes in and about the optic nerve, as pressure of inflammations, or of tumors, leading to optic neuritis; (4) cerebral changes, such as hemorrhages, tumor of the brain, localized injury of the brain, usually leading to localized types of amblyopia (hemianopsia); (5) defective cerebral development, causing congenital amblyopia.

AM'BLYOP'SIDÆ, a family of freshwater fishes closely allied to the cyprinodonts and remarkable for living altogether in caves, except one species found in the ditches of the rice-fields of South Carolina. Among many peculiarities may be noted the facts that the vent is at the throat instead of in the usual position behind the ventral fin, and that all of the under-ground species are blind. See CAVE-DWELLING ANIMALS.

AMBLYPO'DA, an extinct order of hoofed mammals found in the Eocene formations of North America and Europe. They are distinguished by a primitive pattern of teeth and short post-like feet resembling those of elephants. The chief types are Pantolambda, Coryphodon and Uintatherium (qq.v.).

AMBLYS'TOMA, a genus representing a subfamily (*Amblystomatinæ*) of salamanders of North and Central America and northern Asia. The parasphenoid bone is toothless. A common American species is the spotted salamander (*A. tigrinum*) whose young in certain Mexican lakes never reach the adult condition, and are known as "axolotls." See AXOLOTL; SALAMANDER.

AMBO, a reading-desk or pulpit, which in early churches was placed in the choir. The epistle and gospel were read from the ambo, and sermons sometimes preached from it. It had two ascents — one from the east and the

other from the west. In many churches there were two ambos, one on each side of the choir, from one of which the gospel was read, and from the other the epistle. The earliest are at Ravenna in the cathedral and the Church of Saint Apollinare, and are of carved marble (See PULPIT). The name ambo was also given to an eagle-shaped reading-desk, now usually termed a lectern.

AMBOCEPTORS, also called immune bodies, are protective substances which develop in the body following injection of cells of different kinds. Nearly all animal cells and plant cells are capable of producing amboceptors. The amboceptors are of great value in aiding the body to recover from an infection. The problem is discussed more fully in the article on IMMUNITY (q.v.).

AMBOISE, am'bwäz, **Aimeric d',** a famous French admiral, brother of Georges d'Amboise (q.v.); d. 1512. He became in 1503 Grand Master of the Knights of Saint John in Rhodes, and gained a great victory over the Sultan of Egypt in 1510.

AMBOISE, Bussi d'. See BUSSI.

AMBOISE, Georges d', French cardinal and minister of state: b. Chaumont-sur-Loire 1460; d. 1510. He became successively bishop of Montauban and archbishop of Narbonne and of Rouen, and in 1498 Louis XII made him Prime Minister. He failed in his attempt to secure the papacy, but his policy toward France was wise and statesmanlike. He reformed the Church, remitted the people's burdens and conscientiously labored to promote the public happiness.

AMBOISE, France, a town in the department of Indre-et-Loire, on the Loire, 15 miles by rail east of Tours. It lies in a rich vineyard district and has been called "the Garden of France." The town is memorable as the scene of the conspiracy of the Huguenots against the Guises (1560). It contains a beautiful chateau dating from the time of the Renaissance. Pop. about 4,600.

AMBOYNA, or **AMBOINA,** the most important of the Molucca Islands, being the seat of their government and the centre of the commerce in nutmegs and cloves; greatest length, 33 miles; greatest breadth, 10 miles; area, about 260 square miles. It is composed of two unequal peninsulas united by an isthmus about a mile broad, the larger known as Hitu, the smaller as Leitimor. Its general aspect is attractive and its climate salubrious. It is covered almost throughout with forests, affording a great variety of beautiful wood for inlaying and ornamental work. Sugar and coffee are cultivated. The surface is generally rugged and hilly, sometimes rising into mountains of granite. The soil in the valleys and along the shores is very fertile, but a large portion remains uncultivated. In 1605 Amboyna was taken by the Dutch from the Portuguese, and shortly afterward some English factories were erected there; but in 1623, the Dutch seized the English fort, tortured frightfully Captain Towerson and nine others to obtain a confession of conspiracy and put them to death — a performance notorious as "The Massacre of Amboyna." Pop. 30,000. Amboyna is also the name of one of the residencies into which the Molucca Islands are divided, including Buru, Caram, Aru Islands, the Bandas and others. Pop. 95,000.

AMBOYNA, capital of the Dutch residency in the Moluccas, situated on the northwest shore of the peninsula of Leitimor and defended by Fort Victoria. The houses, built in Dutch fashion, are generally of one story, owing to the frequency of earthquakes, one of great severity occurring in January 1898. It contains a governor's palace, town-house, two Protestant churches, several mosques, an orphan hospital, a theatre and a large covered market-place. The streets are wide, and are planted on each side with rows of fruit-trees. Pop. about 10,000.

AMBRIDGE, Pa., borough in Beaver County, 16 miles northwest of Pittsburg, on the Ohio River and on the Pennsylvania Railroad. Bridge building, molding of metals and the manufacture of tubes are the chief local industries. The water works are municipally owned. Pop.. (1910) 5,205; (1916) 8,700.

AMBRIZ, äm-brēj', seaport, capital of a district of the same name in the Portuguese colony of Angola, West Africa. Originally the capital of Quibanza it was taken by the Portuguese, who in 1855 built a fort, a custom-house and a church which formed the nucleus of the present town. It has a number of factories and a trade in india-rubber, coffee and palm oil. Pop. about 3.000.

AMBROS, äm'brōs, August Wilhelm, Austrian writer on music: b. 17 Nov. 1816 in Mauth, Bohemia; d. Vienna 28 June 1876. He was trained for the civil service and served in it with distinction; but his tastes led him elsewhere, and he rose to eminence as the author of 'The Limits of Music and Poetry,' besides numerous essays and studies connected with art. His masterpiece, 'The History of Music' (1862-68) a work which cost him many years of labor, was carried only to the fourth volume. A fifth, completing the work, was added by Langhaus.

AMBROSE, Saint, Latin father of the Church: b. 333, or, according to other accounts, 334, probably at Treves (the ancient Augusta Trevirorum), where his father resided as pretorian prefect of Gallia Narbonensis; d. Milan, 4 April 397. It is told that a swarm of bees covered the eyes of the boy while slumbering in the court of his father's castle, and the nurse was astonished to perceive the bees going in and out of his mouth without doing him any injury. His father, possibly recalling a similar wonder, mentioned of Plato, prophesied future greatness for his son. Ambrose studied law at Rome under Anicius Probus and Symmachus, and then went to Milan and began to plead causes while yet a youth. His pleadings were so eloquent and skillful that in a short time Probus, the prefect of Italy, chose him a member of his council; and in 369, with the approval of the Emperor Valentinian, appointed him governor of the provinces of Liguria and Æmilia (North Italy). In 374 he was called to the bishopric of Milan by the unanimous voices of Arians and Catholics. Ambrose long refused to accept this dignity, but in vain. He fled by night, and thought himself on the way to Pavia, but unexpectedly found himself again before

the gates of Milan. At length he yielded, received baptism, for he had hitherto been only a catechumen, and eight days after was consecrated a priest. The 7th of December is still celebrated by the Church on this account. On his elevation to the bishopric he bestowed all his wealth on the Church and among the poor, resolving to live as simply as possible, and at the same time to exercise his functions as an ecclesiastical ruler with firmness and vigor. He was employed by the court to negotiate with Maximus, then threatening Italy, whose advance he succeeded for a time in arresting (383). Four years later he was sent on a like mission, but his conduct on this occasion so offended Maximus that he had to return to Milan, having accomplished nothing. In his struggles against the Arian heresy he was opposed by Justina, mother of Valentinian II, and for a time by the young Emperor himself, together with the courtiers and the Gothic troops. Backed by the people of Milan, however, he felt strong enough to deny the Arians the use of a single church in the city, although Justina, in her son's name, demanded that two should be given up. He was commanded to quit the city, but this he refused to do, being still supported by the people. About this time Ambrose, instructed by a dream, searched for and found the relics of two martyrs, Gervasius and Protasius. The people crowded to see these bones, and, according to Ambrose himself, the eyes of the blind were opened and devils were cast out by touching them. Although the court derided these miracles they were accepted by the people, and the triumph of orthodoxy was secured. He had also to oppose paganism. In 390, after the massacre at Thessalonica, he refused the Emperor Theodosius entrance into the church of Milan for a period of eight months, only restoring him after a public penance. (See THEODOSIUS). The later years of his life were devoted to the more immediate care of his see. His writings (the best edition is by the Benedictines, 2 vols. folio, 1686–90), bear marks of haste, and show his theological knowledge to have extended little beyond an acquaintance with the works of the Greek fathers, from whom, especially Origen, he borrowed considerably. The "Ambrosian Chant" or "Te Deum Laudamus" has been ascribed to him, but was written a century later. He may be considered the father of the hymnology of the Latin Church. He is the patron saint of Milan, which observed his 15th centenary in 1897.

AMBRO'SIA, in the Greek mythology, a balsamic juice which formed the food of the gods and preserved their immortality. It was used also as an ointment. Mortals permitted to partake of ambrosia received an increase of beauty, strength, and swiftness, becoming in some measure assimilated to the gods.

AMBROSIA BEETLE. See WOOD-BORING BEETLES.

AMBROSIAN CHANT. See GREGORIAN CHANT.

AMBROSIAN LIBRARY, public library in Milan; founded by the Cardinal Archbishop Federigo Borromeo, a relation of Saint Charles Borromeo, and opened in 1609. It now contains over 175,000 printed books and 8,400 MSS.

AMBROSINI, Bartolomeo, Italian naturalist: b. Bologna, 1588; d. there, 1657. He was a pupil of Aldrovandi, several of whose works he published, and whom he succeeded eventually as director of the university botanical garden He studied at the university, and became successively professor of philosophy, of botany and of medicine; and during the plague of 1630 in Bologna he worked assiduously for the relief of the sufferers.

AMBULANCE, a term generally applied in England and America to the wagon or other vehicle in which the wounded in battle, or those who have sustained injuries in civil life, are conveyed to hospital. More strictly, in military parlance, the term imparts a hospital establishment moving with an army in the field, to provide for the collection, treatment and care of the wounded on the battlefield, and of the sick, until they can be removed to hospitals of a more stationary character. An ambulance organization, differing in minor details, now prevails in all civilized armies.

AMBULANCE COMPANIES. In the United States a limited number of field hospitals and ambulance companies are maintained in time of peace to provide trained organizations for duty with the troops when they are on field service and to afford a means for training officers and men of the sanitary service in the work of the sanitary field organizations. In the training of these organizations special attention is given to those elements of field work for instruction in which only limited facilities are afforded at posts, such as the practical use of the articles of field equipment, lines of aid, equitation, care of animals and the use of the pack-saddle. The personnel of these organizations in time of peace comprise two classes: (a) A permanent cadre, consisting of such number of non-commissioned officers and men as are deemed necessary to maintain continuity of policy and method in instruction; (b) temporary personnel attached to these organizations for purposes of instruction. On field service with a mobilized division the field hospitals and the ambulance companies operate under their two respective directors whose relation to them is similar to that of a major of the line to his battalion. The senior officer of two or more field hospitals or ambulance companies conducts the course of instruction as though they were a single organization and assigns the instructors from the permanent personnel of the organizations as he deems best. In other respects, however, the several organizations retain their autonomy as separate and distinct administrative and tactical units, each under the command of its own senior medical officer. The discipline and interior economy of these organizations conform so far as practicable to those of a company of infantry. The program of instruction for these organizations, the sequence of the subjects, the manner in which the same are taught, the details thereof to be taken up and the time to be given to each are prescribed by the War Department.

The personnel of an ambulance company at war strength are ordinarily distributed as follows: (a) With the dressing station, including the litter-bearers — four officers, one

sergeant first class, six sergeants, one acting cook, 40 privates first class and privates, all of the medical department; (b) with the wheeled transportation — one officer, one sergeant first class, one sergeant, one acting cook, 28 privates first class and privates (one as farrier, one as saddler, two as musicians, 12 as ambulance-drivers and 12 as ambulance orderlies), all of the medical department; also one sergeant (blacksmith) and three privates (drivers) of the quartermaster corps. The function of the ambulance company is to collect the sick and wounded, to afford them temporary care and treatment and to transport them to the next sanitary unit in the rear. In camp it operates the ambulance service between the camp infirmaries and the field or other hospitals. On the march ambulances are distributed among the marching troops, usually one to each regiment, for the purpose of supplying transportation to those who become unable to march.

In combat the ambulance company operates in two parts. The first establishes and operates a dressing station and collects the wounded thereat, the second operates the wheeled transportation in evacuating the wounded. The dressing station party, including the litter-bearers with its equipment on pack-mules, moves forward in rear of the troops ready to establish the dressing station. The location of the dressing stations and the number to be established is determined by the division surgeon acting under the instructions of the division commander. The director of ambulance companies supervises their opening, giving the necessary orders therefor to the commanders of the ambulance companies. The site selected for a dressing station should have the following advantages: (1) Protection from rifle fire, (2) protection from direct artillery fire, (3) accessibility for wheeled transportation, and (4) a supply of water. Effective shelter from fire is the chief desideratum. A site inaccessible to ambulances on account of exposure to fire need not invariably be condemned, for the greater part of the work of the ambulances is done after the close of the battle or after nightfall. The station is pushed as far to the front as possible to reduce to the minimum the distance over which the wounded must be carried on litters. In some cases in which the establishment of the dressing station is delayed, or in which the troops are about to move forward, it may be possible to locate the dressing station at the aid station, thus practically eliminating one station. Under these circumstances the dressing station assumes the work of the aid station and the personnel of the two co-operate until the aid station moves forward. The requirement that the sanitary personnel with the combatant organizations keep in touch with those organizations may make it necessary for them to leave the wounded where they fall, pausing only to administer such aid as may be absolutely essential. Cases thus left are collected and cared for by the dressing station party as it advances. As soon as the dressing station is open its bearers under the direction of a medical officer proceed to the front as far as the enemy's fire permits. Ordinarily they are divided into as many sections as there are aid stations, each under a non-commissioned officer, and one section proceeds toward each aid station. They direct wounded who are able to walk to the station for slightly wounded. They transport other wounded from the aid station to the dressing station. When practicable they also assist the regimental medical personnel in the care and removal of wounded from points in advance. Meanwhile the commanding officer of the company with the dressing station personnel proceeds to put the dressing station in condition to receive patients. When possible for wheeled transportation to reach the dressing station a message is sent to the officer in charge of the ambulance train directing him to report at the station with the ambulances.

The work of the dressing station is carried on under the following departments: Dispensary, kitchen, receiving and forwarding, slightly wounded and seriously wounded. All wounded pass through the receiving and forwarding department. Those whose injuries are not sufficient to incapacitate them for the present performance of their military duties are directed, after receiving the necessary treatment, to return to their units and the fact that such directions have been given them is noted upon their diagnosis tags. Other slightly wounded, able to walk, are, after like treatment, immediately directed to the rear in command of their highest-ranking officer or soldier. Generally they are sent to the station for slightly wounded. At the dressing station only such operations are performed as may be immediately required to save life or to render the patients fit for further transportation. The rules to be followed generally are that no operative or other interference should be attempted under conditions unfavorable for asepsis or antisepsis and also that no wounded for whom transportation is available should be delayed at the dressing station. Conditions in these respects vary widely in different battles.

The ambulances and wagons remain farther to the rear than the dressing station (usually in proximity to some unit or station through which communication with division headquarters may be maintained) until it is practicable to determine a line of evacuation for the wounded. As soon as the dressing station is established and the location of the field hospital is determined a safe route for the ambulance service between these two establishments is sought and when found the ambulances advance to begin the removal of wounded from the dressing station. The wagons of the ambulance company, carrying a reserve of dressings, remain at a field hospital whence the supplies are sent forward by ambulances returning to the dressing station. Ambulances must reach the station as early as possible even at the risk of losses. Ordinarily ambulances carry wounded only from the dressing station to the nearest field hospital, immediately returning to the former. During the daytime when a battle is still in progress it is rarely possible for ambulances or other wheeled vehicles to advance farther to the front than the dressing station. Opportunity to have them do so will sometimes occur at night, and on the conclusion of an engagement they should always be used as far

as may be at all points on the battlefield. Should it be impossible to evacuate the wounded at a dressing station before it is closed or moved, by reason of retreat or otherwise, the commanding officer of the ambulance company leaves with the wounded according to their number and condition sufficient medical personnel and supplies to provide for their immediate necessities, and advances or withdraws with the division the remainder of the personnel and equipment.

AMBULANCE CORPS. The modern army corps has become so large and is so likely to break up into parts operating separately that its ambulance service does not give the best results when kept together as a homogeneous whole. European experience shows that not the corps but the division should be the unit of ambulance organization. The name of ambulance corps is too well consecrated by usage to permit of any alteration in form or general meaning, but it is admissible to change the composition of the body it designates.

Organization.— The ambulance corps should be made up of independent units, each one corresponding to a division of the army corps and operating with it. The unit thus assigned to a division is the «Ambulance» of the French; the «Sanitäts detachment» of the Germans; the «Sanitätscolonne» of the Austrians; and the «Bearer Company» of the English. The name of Ambulance Brigade, which is proposed for it, seems to be the most appropriate for the United States army.

The ambulance corps, thus reorganized, is under the general direction of the medical director. It consists of as many ambulance brigades as there are divisions in the army corps, and an additional one, known as the Headquarters Ambulance Brigade, or the corps troops (cavalry, artillery, engineers, etc.), and the reinforcement of any divisional brigade in need of assistance. Our hypothetical corps of three divisions would, therefore, consist of four ambulance brigades fully manned and equipped for independent action.

What should be the strength of the medical personnel (bearers and nurses) of an ambulance brigade? Our rule assigns 1.5 per cent of the command to the ambulance corps, therefore, if we have a division 12,000 strong, the ambulance brigade will get a detail of 180 men. From this number must be deducted the quota to the Headquarters Brigade, say, 24 men. Of the remaining 156, 36 will do duty as ambulance orderlies. We have now left only 120 men, a number which represents the exact rate of 1 per cent of the strength of the division. These 120 men are divided into stretcher-bearers and nurses — 96 of the former and 24 of the latter. The 96 bearers will man 24 stretchers, or at the rate of two stretchers per 1,000 combatants. These two, added to the four stretchers manned by the regimental bearers, give us six stretchers for each full regiment, independently of the help which in case of need could be obtained from the Headquarters Brigade.

The composition of an ambulance brigade is complex. Its total personnel, for a division of 12,000 men, would be about as follows: One surgeon in charge; five surgeons; one captain; one first lieutenant; one second lieutenant; one sergeant-major; eight sergeants; eight hospital stewards; 24 hospital attendants (nurses and cooks); two buglers; 36 ambulance drivers; 36 ambulance orderlies (nine of whom to be mounted corporals); 10 wagon drivers; 96 stretcher-bearers; four mechanics (blacksmith, wheelwright, saddler and farrier). Total, 234.

The matériel consists of 36 ambulances, two medicine wagons, six service wagons for tentage, baggage and supplies and two water-carts. Personnel and matériel are so organized as to admit of being split in halves, each capable of separate action.

The ambulance orderlies follow the ambulances, or ride on the rear step, and are responsible for the safety and comfort of the patients in transit to the depot and the field hospitals. Each of the nine orderly corporals, besides his own ambulance, will also exercise supervision over three others — the four ambulances thus under his authority constituting an ambulance section. The 24 stretchers will be divided into six sections of four stretchers, each section being in charge of a sergeant designated chief of section. The Headquarters Brigade need not be so large as the others. It is made up of 24 men from each of the infantry divisions; therefore, in our hypothetical corps, will have only 72 bearers and attendants.

The three lines of the field services are the regimental help-stations, the ambulance brigade depot and the field hospitals.

Help Stations.— On the battle-field nothing can be done for the wounded, while under fire, but to lift them upon stretchers and carry them off speedily to the help-station. Here they are rapidly examined and given such immediate attention as may be required to secure their safe transport to the ambulance depot.

The modern formation of infantry advancing against an enemy may be practically described as consisting of three lines: Firing line, line of support, regimental reserves, with an interval of 300 yards between them. The line of support, placed 300 yards behind the skirmishing or firing line, is supposed by tacticians to be comparatively safe from the fire aimed at the first line, while the regimental reserves are entirely safe from bullets. The help-station should not therefore be further than just in rear of the reserves. This will place it about 600 yards behind the firing line. In certain cases, where good shelter is available, and the reserves can get nearer to the front, the station, of course, follows them.

The German and French regiment of infantry, made up of three battalions, is 3,000 men strong; one help-station for each is provided, and considered sufficient. Our formation corresponding in number to the above regiment is the brigade, which seldom would exceed but often fall short of 3,000 men. Such brigade in battle array would only cover a front of from 300 to 500 yards, and, therefore, obviously needs but one station. To have three or more stations 100 or 200 yards apart would be a waste of means and detrimental to the wounded.

A medicine wagon containing the supplies of the help-station and carrying the regimental stretchers should follow each brigade to the field, and advance to the station or as near it as possible.

Ambulance Depot.— The depot of the ambulance brigade constitutes the second line

of help. It is the centre and rallying point of the brigade. Here, as a battle becomes impending, all the ambulances which follow the regiments on the march rejoin the brigade train. If no suitable building can be found, the grounds are cleared by the attendants and hospital tents pitched; the necessary medicines and appliances are drawn from the wagons and held in readiness.

The stretcher-bearers are divided into as many platoons as there are help-stations; each platoon, under command of a lieutenant or the senior chief of section, marches toward its assigned station, followed by a picket of ambulances; these are driven as near the station as possible; as soon as halted, the bearers remove the stretchers and with them proceed to the front, or else first carry off the wounded collected at the help-station. The patients brought to the depot are carefully but rapidly examined, and assorted according to their injuries; one surgeon applies simple dressings, a second attends to serious wounds, a third, with assistants, performs urgent operations.

At what distance in the rear should the ambulance depot be established? We have seen that at 600 yards behind the firing line one was practically safe from bullets; at the distance of about a mile, rather less than more, we shall not only be beyond the range of musketry fire but also beyond the aim of artillery projectiles, and there seems the proper place for the depot. Whatever danger there may be at this distance is reduced to a minimum by a judicious selection of the spot.

Field Hospitals.— The field hospitals form the third line of help. They should be at an absolutely safe distance from the scene of conflict — that is, two or three miles behind the ambulance depot — and have a free outlet toward the line of evacuation. There should be three provided for a division, and all completely equipped. Each accommodates 200 patients and is divided in two equal sections. See FIELD SANITARY SERVICE.

AMELAN'CHIER, a genus of shrubs or small trees of the family *Rosaceæ,* natives of Europe, Asia and America. The species, which are closely related, have alternate, simple, deciduous leaves, numerous racemes of showy white flowers appearing in early spring often before the leaves, and, in summer, edible spherical or oblong red or dark purple berries with more or less bloom. They are commonly known under the names Juneberry, shad-bush and service-berry, and some species are cultivated for their edible fruit or for ornament. They are hardy, succeed upon many soils and in many climates and are readily propagated by seeds or suckers.

AMÉLIE-LES-BAINS. See ARLES.

AMEN, a word of Hebrew origin now generally used in all the languages of Christendom, having the sense of firmly, or surely, certainly, truly. The most common use is at the end of a prayer or creed where it has the sense of "So I believe." This usage was very early. In the Apostolical Constitutions the word was used for a response. Jerome mentions its use in his time. J. Massie in his excellent article in Hastings' 'Dictionary of the Bible' finds four distinct uses of the word: (1) For the "purpose of adopting as one's own what has been said," often "doubling the word for emphasis." (2) "It is used in confirmation of one's own prayers, thanksgivings, benedictions or doxologies." (3) "It is used once at the close of an affirmation of one's own to confirm it solemnly in faith." (Rev. i, 7) Christ uses it as a word of introduction. (4) The Amen is used "as a name or description of Christ and of God." Another usage occurs in several passages in the Old Testament. When the priest or administrator of an oath has administered the oath, all bystanders who say amen thus bind themselves by the oath as surely as if they had said it. (Numbers v, 22; Deuteronomy xxvii, 15, 17 are samples.)

AMENDE HONORABLE. In the old armies of France, this expression signified an apology for some injury done to another, or satisfaction given for an offense committed against the rules of honor or military etiquette, and was also applied to an infamous kind of punishment inflicted upon traitors, parricides or sacrilegious persons, in the following manner: The offender being delivered into the hands of the hangman — his shirt stripped off, a rope put about his neck and a taper in his hand — was led into the court, where he begged pardon of God, the court, and his country. Sometimes the punishment ended there; but often it was only a prelude to death or banishment to the galleys.

AMENDMENT, in law, the correction of any mistake discovered in a writ or process. At common law, amendments, in the absence of any statutory provision on the subject, are in all cases in the discretion of the court for the furtherance of justice. The power of amendment is regarded as incidental to the exercise of all judicial power. Amendments are very liberally allowed in all formal and most substantial matters under statutes in modern practice. They are allowed either without costs to the party amending, or upon such terms or conditions as the court may see proper to impose. In legislative proceedings, a clause, sentence or paragraph proposed to be substituted for another, or to be inserted in a bill before Congress, and which, if carried, actually becomes part of the bill itself. As a rule amendments do not overthrow the principle of a bill. The Senate of the United States may amend money-bills passed by the House of Representatives, but cannot originate such bills. The Constitution of the United States contains a provision for its amendment (U. S. Const. Art. 5). See CONSTITUTIONAL LAW; PARLIAMENTARY LAW.

AMENDMENTS, Constitutional. See INITIATIVE; REFERENDUM; CONVENTION, CONSTITUTIONAL.

AMENHOTEP, ă-mĕn-hō-tăp, or **AMENOPHIS,** the name of four Pharaohs of the 18th dynasty. AMENOPHIS I reigned for 10 years about 1570 B.C. After his death he received divine honors and was made patron of the necropolis of Thebes. His mummy was discovered at Dair-el-Bahri and now lies in the Gizeh museum. AMENOPHIS II reigned for about 25 years about 1450 B.C., carried on several wars and maintained the integrity of the territory inherited from his father. AMENOPHIS III was the son of Thothmes IV and reigned for 35 years about 1410 B.C. He lost a great portion of his Asiatic territory, attained

renown for the erection of public temples, especially the great temple of Thebes, of which two colossi remain. The great tomb of the parents of his wife Teye was discovered in 1905.

The most important of these rulers was AMENHOTEP IV, later called Ikhnaton. He was the son of Amenhotep III and Queen Teye Early in life he became interested in the theology of the priests. As the result of his contemplation he gained the idea of "A single controlling intelligence, behind and above all sentient beings including the gods." This intelligence enforced his designs by his "word." This teaching anticipated the doctrine of the Logos of Philo and others. This god was supreme above all and after a time was called Aton. The priesthood of Amon, the former national god, would have supplanted him if they could but the priests of the other gods at that time supported him. He became high-priest of all the priesthoods of Egypt. He next planned to completely abolish the worship of the other cults, and thus became the arch-heretic of his time. He had the names of the gods erased from all monuments. Finally he left Thebes and founded a new city, Akhetaton, "Horizon of Aton," which was built on the site of Tell El-Amarna. He raised Merire, one of his favorites, to the high-priesthood. After a few years his empire was overrun by the Hittites and the Asiatic part was lost entirely. He had no son to succeed him, but was succeeded by Tutenkhaton, his son-in-law. He died about 1358 B.C. after a reign of 17 years. He came to be known in succeeding years among his people as the "criminal of Akheton." He was buried in a tomb, which he had prepared for himself and family, in a lonely valley some miles east of the city. In 1888 in a small room in Akheton were found the archives of his foreign office and many of its documents published under the title of 'The Tell El-Amarna Letters.'

AMENT, William Scott, American missionary: b. Owosso, Mich., 1851; d. 1909. He was educated at Oberlin, and studied thology at Union and at Andover Theological seminaries. The American Board of Foreign Missions sent him as missionary to China. In 1900 he was one of the 800 foreigners, who with 3,000 native Christians were besieged in the Boxer revolt at Peking. When the siege was raised, Ament and his companions together with 500 native Christians took possession of the palace of a Mongolian prince. He took an active part in reinstalling the native Christians and in the readjustment of things generally after the revolt. He was severely criticised in the American press because of his course, and some journals went so far as to brand him as morally guilty of looting. The charges fell through, however. Consult his life by H. D. Porter (New York 1911).

A'MENTIF'ERÆ, a name which has been used to include in one class several natural orders of plants which bear their flowers in catkins (amenta). They are trees and shrubs chiefly of temperate climates, and include many common trees, such as willows and poplars, oak, beech and chestnut, walnut and bog myrtle.

AMERICA: a brief account of the derivation and meaning of the word. The name Amalric (in Old High German Amalrich or Amelrich; Gothic Amala-reiks or -reikis; variants Am-el, Am-ul and Am-il-rih, -rich or ric) originated among the Goths in northern and central Europe; was adopted by other nations of the Teutonic stock before the great migration of those kindred peoples; and was carried into all west European countries — even to England and the Mediterranean coasts — by the Northern conquerors between the 5th and 12th centuries. The famous East Gothic dynasty of the *Amala* received its name, according to tradition, from a national hero whose mighty labors had earned for him the title *Amal,* which, as we shall presently explain, was a purely democratic term, connoting personal character and achievement, without the slightest implication of social rank.

From the dynastic name, the Goths as a race, or, more narrowly, the East Goths, were familiarly called *Die Amelungen;* the Amal king in the 4th century ruled from the Baltic to the Black Sea; at the beginning of the 6th century a king of the West Goths in Spain and France, a grandson of Theodorich the Great, was called *Amalarich.* The word of democratic meaning thus spread through a few lands was destined to live, in the centuries that followed, united inseparably with the other short word which appears in the name of the West-Gothic king.

The signification of the compound is of extraordinary interest. Its second member appears in Old English (for example, in the Anglo-Saxon epic of Beówulf) as *ric,* meaning *powerful,* or when a substantive, *control, domain* or *empire* — the modern German *Reich.* According to von Humboldt ('Examen Critique,' Vol. IV) and Professor von der Hagen, the fundamental meaning of the first member (its root, *am,* often occurring in the dialects of Iceland and Scandinavia in the forms *ama, ambl,* etc.) is *labor,* endurance of great toil. Accepting this view, we find that the title of the Gothic national hero, *Amal,* expressed popular appreciation of "the man of great or laborious enterprises." Simply that. In order to show that *Amal,* when uniting with the aristocratic monosyllable, retained its original value, so characteristic of the people who used it every day; that, at least, they never thought it meant "the mighty," as some authorities have asserted recently; we need only point to the facts that they prefix it to *ric,* which itself signified "mighty," and that folk stories served to remind them constantly of the primitive meaning of the first member. Amalric, then, was the name which compacted the old ideal of heroism and leadership common to all Germanic tribes, the ideal that stands out most clearly in the character of Beówulf — the Amal of Sweden, Denmark and Saxon England. The compound plainly meant what the north European hero-stories described: The man who ruled because he labored for the benefit of all. In France this name was softened to *Amaury.* Thus, a certain theologian who was born in the 12th century at Bène, near Chartres, is called indifferently Almaric of Bène or Amaury of Chartres. England, in the 13th century, could show no more commanding figure than Simon of Montfort-*l'Amaury,* Earl of Leicester, to

whom King Henry once said, "If I fear the thunder, I fear you, Sir Earl, more than all the thunder in the world." A Norman *Amalric* was that Earl Simon, creator of a new force, and a democratic one, too, in English politics. "It was," says the historian Green, "the writ issued by Earl Simon that first summoned the merchant and trader to sit beside the knight of the shire, the baron, and the bishop in the parliament of the realm." In Italy, after the Gothic invasion, the Northern name suffered comparatively slight euphonic changes, which can be easily traced. As borne by a bishop of Como in 865 it became *Amelrico* or Amelrigo. But the juxtaposition of the two consonants *l* and *r* presented a difficulty in prononciation which the Italians avoided: they changed *lr*, first, to double *r*, and then to a single *r*. Still, 600 years after Bishop Amelrigo died, the Florentine merchant, explorer and author usually retained the double *r* in his own signature, writing "*Amerrigo* Vespucci," and, by the way, accenting his Gothic name on the penultimate (Amerigo, not Amérigo). In Spain the name must have been rare, since it was often used alone to designate the Florentine during his residence in that country. There was, apparently, no other Amerigo or Amerrigo in the Spanish public service early in the 16th century. We must again look toward the North for the scene of the next important change, and among the men of a Northern race for its author.

Martin Waldseemüller, a young German geographer at Saint Dié, in the Vosgian Mountains, whose imagination had been stirred by reading Amerigo's account of voyages to the New World, bestowed the name *America* upon the continental regions brought to light by the Florentine. It is not enough to say, with Mr. John Boyd Thacher ('Columbus,' Vol. III; compare also his interesting 'Continent of America'), that Waldseemüller "suggested" this designation. As editor of the Latin work, the 'Cosmographiæ Introductio' (5 May 1507), he stated most distinctly, with emphatic reiteration, his reasons for this name-giving; placed conspicuously in the margin the perfect geographical name, America, and at the end of the volume put Vespucci's narrative. Further, on a large map of the world, separately published, he drew that fourth part of the earth which was the 'Introductio's' novel feature — marking it firmly, "America." It is impossible to adopt the suggestion of Professor von der Hagan, that Waldseemüller was distinctly conscious of giving the new continent a name of Germanic origin. "Quia Americus invenit," says the 'Introductio,' "Americi terra sive America nuncupare licet." But the case stands otherwise when we ask why Europeans generally caught up the word. Its association with so many men before Vespucci certainly commended it to Northern taste.

MARRION WILCOX.
Author of 'History of War with Spain,' etc.

AMERICA, the second in size of the isolated land masses of the globe; containing about three-tenths of the total land surface and perhaps half the cultivable area, but less than one-tenth the population. The name was originally used only for central Brazil, and was applied in honor of the Italian, Amerigo Vespucci (q.v.), who claimed that he discovered it. (See AMERICA: a brief account of the derivation and meaning of the word). It was first employed for the entire known Western world by Mercator in 1541, and is usually but not properly understood to include Greenland, which is physically a part of Europe.

The extreme points marking the limits of this vast continent are: North, the point of Boothia Felix, in the Strait of Bellot, lat. 71° 55′ N., long. 94° 34′ W. (in Alaska Point Barrow, lat. 71° 23′ 31″ N., long. 156° 21′ 40″ W.); South, Cape Froward, lat. 53° 53′ 45″ S., long. 71° 18′ 30″ W., or, if the archipelago of Tierra del Fuego is included, Cape Horn, lat. 55° 59′ S., long. 67° 16′ W.; West, Cape Prince of Wales, lat. 65° 33′ N., long. 167° 59′ W.; and East, the Point de Guia, lat. 7° 26′ S., long. 34° 47′ W. Its total area is not far from 16,000,000 square miles, without Greenland or the polar archipelago.

Topography.—Nominally one "continent," it is really two if not three sections, geologically independent. The northern, from the Arctic Ocean to the Isthmus of Tehuantepec in Mexico on the west (where the last slopes of the Anahuac plateau of the Rocky Mountains sink to the plain, and the Guatemalan Highlands are not in sight), and Florida on the east, is connected with the southern by two great parallel ridges. One called Central America, is continuous, joining South America at the west side, and dwindling to 28 miles across at the Isthmus of Panama; the other, partly submerged, consisting of Haiti, Porto Rico and the Lesser Antilles, joining at the eastern side; the two united transversely by Cuba and Jamaica and the projection of Yucatan, and enclosing the Caribbean Sea, 1,500 miles from end to end. The continental mass, 8,700 miles from Alaska on the northwest and Boothia Felix on the northeast to the south end of Patagonia, is prolonged to a total of some 9,600, nearly four-fifths the distance from pole to pole, by a vast archipelago of Arctic islands up from Hudson Bay (ending suddenly like a drift line about 125° W. long., and at Grant Land about 83° N. lat.), and by another at the south called Tierra del Fuego, on the Antarctic Ocean. But as with the eastern continent, some force has massed the land chiefly at the north: two-thirds of the continent is north of the equator; the extreme point of the continuous northern islands reaches to a few hundred miles from the pole, the last of the southern is 2,350 miles from it; Alaska is 1,100 from the north pole, Argentina is 3,400 from the south. The same causes make it form part of a nearly solid ring on the Arctic Ocean, the northwest projection of Alaska being separated from the northeast of Kamchatka by only 40 miles of strait, and the continent being connected with Europe by a series of islands one to two hundred miles apart; while the immense though widely unequal gulfs of the Pacific west and the Atlantic east separate the habitable portions.

The axial dimensions of the continent are not very dissimilar to those of the eastern. Its length is about the same as the breadth of the other from China to England, its greatest breadth about the depth of the other from the Arctic to the Indian Ocean; but its relative slenderness gives it less than half the area. It

is in fact an immense peninsula slightly severed from the main mass, with the shape and the southerly direction of the majority of peninsulas. From nine to ten thousand miles long, it is little over 3,000 across its main north and south lines, from Labrador to British Columbia, or from Peru to Brazil; about 2,100 from Savannah to San Diego, a few hundred across Mexico, 1,725 at the Tropic of Capricorn just above Rio Janeiro, 750 from Buenos Ayres to Valparaiso, and so on southward. The Atlantic Ocean is relatively small and of regular breadth from Laborador and Brazil to England and Liberia, compared with the immense abyss of the Pacific and its sweeping arch from the Bering Sea to Australia and Chile; from Newfoundland to Ireland is but 1,900 miles, from Cape Saint Roque in Brazil to Cape Palmas in Liberia but 1,700; while from San Francisco to Yokohama is 5,500, from Quito to Singapore (almost exact antipodes) 12,500, and from Valpariso to Sydney 8,000. Strangely enough the continents fit together somewhat as would the blocks of a dissected map. The great eastern projection of North America is toward the Bay of Biscay, that of South America toward the Gulf of Guinea, the great western projection of Africa toward the Gulf of Mexico and the Caribbean Sea. The same closure (about 45°) which would bring Newfoundland against Brittany and Labrador against the British Isles, would make the Kongo empty against the Brazilian coast and the West Indies surround Senegambia. In physical character also the northern and southern portions of each are akin: northeastern North America has the broken island-fringed peninsular coasts and the gigantic inlets and inland seas of Europe, while South America has the solid coast-wall and the absence of lakes characteristic of western Africa. Not to mention the great polar archipelago or Hudson's Bay, and allowing the archipelago at the south end of Chili to set off against the Alexander Archipelago along the south Alaskan coast, there is no parallel in South America to oceanic bodies like the Gulf of Mexico, or lesser ones like the Gulf of Saint Lawrence northeast to Puget Sound northwest, or the Gulf of California southwest; or the mass of sheltered bays and sounds along the eastern coast to the Great Lakes; to islands like those around the mouth of the Saint Lawrence or Vancouver's, or peninsulas like Nova Scotia, Florida and Lower California. It must be said, however, that there are strong physical differences between South America and Africa: the chief mountain ranges of the former being on the west, of the latter on the east; the African rivers are less copious, and mostly have cataracts above their mouths, proving recency of origin. It has been argued, not without some show of reason, that these structural resemblances are more than accidents, but scientists are far from agreeing as to the cause, and a discussion of the high-sprung theories that have been advanced to account for them would be out of place here.

Apart from this, the structural characteristics of the northern and southern continents have striking similarities, largely nullified for human use by the difference in location already mentioned. Each is a rather slender triangle with the vertex to the south. Each is joined to the next northern portion of the globe by a northwestern peninsula, the trend of the whole as far south as Bolivia being regularly southeast from Bering Strait, just as that of the Asiatic coast to the Philippines is southwest; so that the north Pacific is a semicircular gulf. Each has to the north an immense archipelago and a vast island-ringed inland sea. Each has a framework of mountain and plain correspondent in general, though with some important differences. In each, according to the law that the largest continental mountain chain is on the side of the largest ocean, there is a western range of immense height and mass, hundreds of miles broad and split into parallel sections sometimes connected by transverse spurs, stretching its entire length; quite recent in origin, and the volcanic action which raised it still energetic in parts. The Andes in South America thus correspond to the Rockies in North America; but the current idea that they form part of one continuous system is erroneous,—the Andes end in Venezuela, and the Rockies are of different genesis. Each continent has on the east a much shorter chain, much older and therefore much lower, from the erosion through geologic ages, and its volcanic fires long since spent; and as the highest points are worn down earliest, each is now rather a broad plateau with some elevations than a mountain wall. The Alleghany-Appalachian system in the United States corresponds to the Brazilian chain, which has no one distinctive title. Each continent has also a lateral range beginning in the north centre, turning first south and then east till it ends somewhat north of the eastern vertical chain, and cut in its course by the chief river running northeastward; and in each it is much the oldest part of the continent. The Laurentian chain in North America, crossed by the Saguenay, is a trivial counterpart to the great lateral ranges of Venezuela and the Guianas, crossed by the mightier Orinoco.

Hydrography.— In each continent the two main ranges are connected by an almost uninterrupted plain many hundreds of miles broad, sloping southward to the ocean, and drained by three immense hydrographic systems with slight and sometimes non-existent divides: one running east and emptying just north of the eastern vertical range, the Great Lakes and the Saint Lawrence in the north corresponding in position to the oceanic Amazon in the south; the second running south and discharging a little south of the same range, which thus forms one side of a huge triangle of which the rivers form the other two—the Mississippi and Missouri in North America comparable to the Parana and Paraguay which form the La Plata in South America; a third running northeast and discharging into the northern ocean—the Saskatchewan, with the Red River of the North and Lakes Winnipeg and Manitoba, corresponding to the Orinoco. Besides these, each has a river following the eastern side of a spur from the main range up to the northern ocean, the Mackenzie in the Arctic regions and the Magdalena in Colombia, though the former is the drainage of a great Arctic plain while the latter is confined between two ridges. With regard to the watersheds, those of North America lie within a few miles of each other in Minnesota; the headwaters of the Illinois in the Mississippi Basin lien within a half mile of the Chicago in

the Saint Lawrence system, and the two have now been connected; the Amazon and Plata systems are only three miles apart, and those of the Amazon and Orinoco are actually connected by the so-called "river" Cassiquiare, a deep and broad natural channel about 150 miles long, running either way according to conditions of flooding seasons.

These, however, by no means exhaust the large drainage systems of North America, though in South America the closeness of the western chain to the ocean throws the whole burden on the east. The Pacific slope of the north is drained in the semi-Arctic regions by the immense Yukon, one of the great rivers of the globe. On the eastern side the great mass of the Arctic moors sends its drainage through a network of small streams, and lakes like Great Bear, Great Slave and Athabasca lakes, by the Mackenzie to the northern ocean, the Great Fish River taking the east Arctic waters. Farther south the Pacific drainage is by the Fraser into Puget Sound, and by the Columbia into the Pacific. The smaller Sacramento drains central California. The Great Basin between two arms of the Rockies sends its scanty and precarious rainfall into the Gulf of California by the Colorado. East of the range in the south the Rio Grande has a long course and forms the boundary between the United States and Mexico; but, despite its impressive name, is not of great volume. Between this and the Mississippi system several considerable streams drain the Texas region; the Colorado, Brazos, Sabine, etc. East of the Appalachian system a number of fair-sized and beautiful rivers flow to the Atlantic—the Saint John's, Penobscot and Kennebec, the Connecticut, Hudson, Delaware and Susquehanna, the Potomac, James, Cape Fear, Savannah, etc. In South America the large rivers of the eastern slope are the São Francisco and the Paranahyba of northern Brazil; but between this range and the Amazon system a great plain is drained by the huge Tocantins, which, though emptying only at the mouth of the Amazon, is really a part of its basin.

The drainage systems of America have no parallel on the globe. The Amazon discharges more water into the sea than the eight largest rivers of Asia together, and the Mississippi more than all the streams of Europe large and small. The navigable waters of the Saint Lawrence, Mississippi, Amazon, Orinoco and Plata systems together amount to over 100,000 miles in length. The five Great Lakes of America alone — excluding large bodies like Winnipeg, Manitoba, Champlain, Nicaraugua, Titicaca, etc., and the polar lakes — make up an area of 89,000 square miles, or considerably more than England and Scotland together.

Another physical similarity between the two continents might be found in the relations of the Gulf of Mexico to the northern continent and the great Argentine plain to the southern; both lie in the same position with regard to the eastern and western mountain chains, though the one is submerged.

But the differences are also great. The main drainage system of the central plain in North America is to the south, by the Mississippi; that in South America is to the east, by the Amazon; while the Great Lakes are a great drainage system for the surrounding regions, the melting snows of which supply them through deep rock fissures. They are hollows in the oldest rock elevation of the continent, with the ground sloping away from them in every direction not far from their shores; not a single considerable stream flows into them, nor even into the Saint Lawrence west of Montreal. The most vital difference structurally is due to the position of the western chain. In North America the chief height is on the eastern flank a thousand miles from the Pacific, the gradually lessening slopes leaving space for an empire along that ocean, and their drainage forming great rivers. In the southern continent it hugs the ocean so closely that not a stream of any size flows into the sea, and the cultivable area is but a petty strip on the coast. More than half the whole western side of South America is occupied by one state, some 1,500 miles long by 50 or 60 wide, which even so finds none too much territory with its slender width and partly barren soil. The northern continent has also an immense advantage in the character of its coast line: what with its archipelagoes, sounds and river-mouths in the north, and the sheltered indentations farther south, it is well fitted for commerce, while the whole South American coast has very few good harbors above Patagonia. The greatest differences in the civilized destiny of the two continents, however, are due to the northward massing of the land heretofore mentioned. All the United States and southern Canada lie in the temperate regions; the largest and most fertile part of South America lies in the tropics. The narrow southern part of North America lies in the warm semi-tropic ocean; that of South America in the south-polar sea. A quarter of all North America is a worthless polar waste, but perhaps as large a space of South America is an uninhabited and pestilential tropic jungle; and the improvements in food production and means of warmth which push back the reign of the one are perhaps balanced by the hygienic inventions and commercial uses tending to reclaim the other. Certainly the northern part has much more arable land and much less miasmatic or enervating climate than the other, nothing whatever that compares with the pestilential coasts and inland swamps of the southern. The Mississippi Valley, the largest continuous body of agricultural land on the earth, is not only of immensely greater value than the grassy steppes of the temperate southern plain of South America, but the prairies of the north, which correspond in position to the Amazonian forests in the south, are a still more striking contrast. Commercially the north is equally favored in comparison. From the nearness of the continent to Europe relatively to Asia, and from the structure of the continent throwing the mass of population and production east of the great mountain chain, the chief commercial relations of America must always be with the western side of the other continent. But North America is directly opposite Europe, the commercial head of the world; while South America's eastern neighbor is barbaric Africa, and most of its harbors are either along the miasmatic northern and northeastern coast, unfit for great cities, or the semi-polar shores of Patagonia.

For general works on American geography and topography consult the 'New Universal Geography,' translated by Keane and Ravenstein from Elisée Réclus' French work (1890–94); Dawson's 'North America, Canada and Newfoundland' (1897); Keane's 'Central and South America' (1901); Shaler's 'Nature and Man in America' (1891); Wright's 'Ice Age in North America' (1889); Powell's 'Physiographic Regions of the United States' in 'National Geographic Monographs' (Vol. I, 1895).

Physiographical Conditions.— The great western chain of both continents, which would seem to be the chief formative base of both, is in fact very much the newest section in each case, though each is of independent origin, as shown by the energy of still remaining volcanic action in both; while the uplift of the eastern side has so long ceased that erosion has worn them down many thousands of feet, trenching immense valleys, and building up vast plains to the west by their detritus.

The Archean portion of North America, the first in order of appearance above the water, is the northeastern part: the elevation in which the Great Lakes and Hudson Bay are hollows, the Laurentian system of Canada, the Adirondacks of northern New York, and a southern tongue east of the Blue Ridge. The line of forces thenceforth acted steadily to the westward, the surface formations regularly growing more recent in that direction. This portion is not merely the oldest of the western continent, but among the oldest on the globe, the "New World" being new only from the standpoint of European history, not of geology or ethnology. This and the polar archipelagoes are composed of Pre-Cambrian or Palæozoic rocks of extreme antiquity. The highlands of Labrador and those extending north and west are mainly granite and other archaic rocks. To the west stretches the vast plateau called by Suess the "Canadian buckler" and known to American geologists as the "Canadian Shield." By erosion this has been almost denuded of its upper Paleozoic strata, and the whole of Hudson Bay excavated to a slight depth on the surface of its eastern section. The eastern part of the Appalachian system is mostly Silurian and older rocks; its western plateau and most of the Mississippi Valley are Carboniferous; while as we go westward we encounter in succession Cretaceous and Tertiary formations.

The Rocky Mountain system shows the greatest activity of volcanic forces at its ends, in Alaska and Mexico. In the old portions of the United States and Canada there are no active volcanoes; and the strength of eruptive force, greatest in the Aleutian Islands, steadily diminishes eastward and southward, occasional eruptions occurring on the southwestern coast, while Mount Wrangell is semi-eruptive only. Within the present boundaries of the United States, exclusive of Alaska, the only volcanic activity within historic times has been that manifested by Lassens Peak, California, during the years since 1914. In Mexico, Popocatapetl and others indicate the beginning of the equatorial belt of volcanic forces exhibited in Central America and the Antilles. But all the Cordilleran system is relatively of recent elevation, though old enough for heavy erosions to have taken place, exposing strata of every age as they were tilted up, creating some valleys and filling up others. In the region from California to Puget Sound the surface over many thousand square miles is lava, the valley of the Snake and Columbia for long distances being cut through lava beds, and fields of black scoriæ forming a peculiar feature in the northern Pacific States and Pacific Canada. To the south of the Appalachian system, along the Atlantic and the Gulf, the flooring is Cretaceous and Tertiary, therefore of recent uplift.

Modifying the erosive action on these primitive elevations there has operated a vast ice cap, the so-called Laurentian glacier, which at an uncertain but relatively recent period, ending probably from 50,000 to 100,000 years ago, covered all North America from the polar regions down to Philadelphia and the Ohio and as far west as the Missouri, leveling hills and hollows, creating soils, excavating lake beds, changing the courses of streams and the outlets of gigantic lakes, cutting out and blocking up fiords and harbors, and depositing enormous masses of rock and gravel moraines. To this, among other things, is due the creation of New York harbor and Niagara Falls, and the turning of the Great Lakes through the rocky Saint Lawrence valley instead of the Mohawk and Hudson. This ice cap has by no means wholly disappeared yet: the immense glaciers on the northwest coast and in the Rocky Mountain heights, some of them hundreds of square miles in extent, are remnants of the one great glacier of ancient times which still covers almost entirely the turtle-back conformation of Greenland.

In South America the eastern highlands are also of enormous antiquity, as shown by their archaic composition, with a sandstone cap not since submerged, their horizontal layers, deep erosions and detritus plains indicating no uplift since the earliest times. The Andes (q.v.) are quite recent, and full of volcanoes still or but recently active, but they are not all of a single age, however, and show successive uplifts. The plains between have Tertiary bases under their alluvial surface.

South America too has had its glacial periods, spreading from the south-polar regions and producing the same effects as in its northern neighbor. The great heights of the Andes keeps them still existent up to and beyond the equator.

The Cordilleran System.— The two great axial chains which form the western base of the double continent, though (as said) of independent origin, have strong similarities and a like relation to the remainder of the surface, and may conveniently be treated together. For their detailed composition and characteristics, see ANDES and ROCKY MOUNTAINS. It should be noted that these are not mere dividing walls, but vast formative elements of the continental masses, and themselves of continental volume. With their foothills and spurs they amount in South America to at least 1,000,000 square miles in area, and in North America to some 2,500,000, or toward a third of the entire surface. They include almost every possible character of soil and climate and natural product, and suitability for every employment,— agriculture, manufactures or mining. They make climates of their own, so that no inference can be drawn from that on one side to that on the other, and the

two may have the difference of five degrees of latitude or 5,000 miles of distance: one side may be a sponge, the other a rainless desert, one a glacier, the other a garden. They make the difference between Puget Sound and Labrador, and on the other hand between the Mexican plateau and the Nicaraguan plains, between Peru and Carácas. They enclose fertile provinces and deserts of rock and sand each large enough for an empire, and have great lakes and considerable rivers entirely their own.

As the development is better studied from the south, we shall begin with South America, whose cordilleras descend by steep short terraces to the seashore, or to a narrow belt of level land immediately adjoining it, form regular chains, display the loftiest masses of all America and send out only short branches to the eastern plains; whereas the North American cordilleras lean, in the west, on elevated plateaus, so as to favor a large development of rivers, are less vertical in their structure and less high and send to the east more extensive ramifications. The name of particular groups of the Andes are taken from the countries to which they more especially appertain; thus, proceeding from south to north, we have the cordilleras of Chile, Bolivia, Peru, Ecuador and Colombia. This, as a whole, is the highest mountain mass on the globe, and except the Himalayas has the highest peaks. Beginning among the rock islands of the Fuegian archipelago, it runs through Patagonia as a low single range with summits of perhaps 8,000 feet; rises swiftly through Chile, growing at once higher and more multiplied, with summits of 12,000 to 18,000 feet, till it culminates in the stupendous *nevado* of Aconcagua, from 23,000 to 24,000 feet high, the loftiest elevation on the western hemisphere. Beyond this it divides into two enormous parallel arms with a high plateau between, and lower ranges to the east in Argentina increasing its complexity. Thence to the Isthmus it is not a ridge, but a rock continent 200 or 300 miles wide, with a great number of peaks from 19,000 to 21,000 and even 22,000 feet high, and the very "passes" over them 15,000 or 16,000 feet above the sea, terrific and nearly impassable gorges above the highest summits in Europe. Sometimes it contains three or four parallel ranges, with two and even three immense tillable valleys on the same base. It attains its greatest breadth at about lat. 18° S., in central Bolivia, where it is some 300 miles wide, with three main ranges; and at this point, in the northern part of the province of Tacna, it and the correspondent coast curve northwest as far as 5°, its course in this direction being exactly coincident with the limits of Peru. On these plateaus was situated the empire of the Incas. Just northeast of the turn it holds the great Lake Titicaca, some 1,800 miles in area, on a high plateau 12,645 feet above the sea, the surface of the lake itself being nearly 12,500 feet above sea-level. This part is called the Royal Cordillera and contains several peaks above 20,000 feet. At the Gulf of Guayaquil it again turns north, with a gradual trend east to about lat. 4° N., when it curves north and west to meet the Isthmus, forming a large but nameless gulf. Near the equator, in Ecuador, are a number of very lofty volcanic summits, the two highest and most famous of which are Chimborazo, 20,498 feet, and Cotopaxi, 19,613 feet. Thence to the Caribbean the height decreases, and in Colombia it divides into three, two running north and the third extending well into Venezuela, the true end of the Andean system.

Central America is hardly a part of either great system. The Isthmus is a low plateau, succeeded by highlands rather than mountains in Costa Rica; then comes the depression nearly filled by Lake Nicaragua, where the elevation sinks to less than 100 feet above the sea. The mountains begin in northern Nicaragua and occupy the entire breadth of Honduras, Guatemala and Salvador from ocean to ocean; but they are not of great height and consist of several detached ranges with active or extinct volcanic peaks. These sink to a broad plain at the Isthmus of Tehuantepec, forming the dividing line between the mass of North American and South American organic species; though zoologically the central plateau is a northern tongue thrust into two lines of tropic territory along the Gulf and Pacific coast.

The Rocky Mountain system, or northern Cordillera, begins with the plateau of Anahuac on which the City of Mexico is situated, the seat of the original culture overthrown by Cortes. It is from 4,000 to 7,000 feet high, and is flanked by mountain ranges and isolated volcanic peaks, active or quiescent, the highest summits in Mexico. Orizaba, the loftiest, is 18,250 feet high; but the most remarkable and imposing is Popocatapetl, rising 17,520 feet from the floor of the valley, the highest peak of the world in practical isolation, its whole height visible from sea-level. At this point the main ridge of the Rockies (the Mexican section is known also as the Sierra Madre, which properly is the name of the northeastern spur) suddenly turns far eastward from the Pacific, and for the remaining 3,500 miles of its course keeps hundreds of miles from it, so that the broad western slope is drained by very large rivers, as the Columbia and Fraser, and in the extreme north the mighty Yukon. But it throws out lesser arms to the west nearly to the ocean. Between the main range and the great Sierra Nevada arm is enclosed the desert Great Basin of Utah and Nevada and northern Arizona and New Mexico: a waste of alkaline earth and naked rocks, of river courses dry except in the infrequent rains, and roaring torrents then for a few hours or minutes; of the great cañons, gulleys cut sometimes a mile deep into the solid rock by the swift sand-laden currents. It is drained to the Gulf of California by the only real stream of water of any size in the whole region, the Colorado. The Sierra Nevada has for its crowning summit Mount Whitney, in California, 14,898 feet high. Still farther west it throws out the Coast Range, running through California, Oregon and Washington up to Puget Sound. The Sierra Nevada is continued, both structurally and through more recent independent volcanic action, by the Cascade Range of Oregon, Washington and British Columbia, with Mount Shasta, 14,510 feet, in the south, and Mount Rainier or Tacoma, 14,526 feet, in Washington. Puget Sound is a submerged trough and the Valley of California a lowland lying between the Coast ranges and

the Sierra Nevada-Cascade ranges. The system as a whole, across from California and Oregon to Colorado and Wyoming, is 1,000 miles wide, with a number of north-and-south ranges rising from a plateau from 5,000 to 10,000 feet high, and with a large number of peaks between 14,000 and 15,000 feet high. The main range in Colorado has for its chief divisions the Front, Sangre de Cristo, Park, Saguache and San Juan ranges; Long's and Pike's Peaks, Blanca Peak, Mounts Lincoln and Harvard and Uncompahgre Peak are the best known of the summits.

The system follows the coast around nearly to Asia, rising in peaks all along the Aleutian Islands, the chief being the noble Shishaldin, 8,000 feet high; and north of Yakutat Bay, a great landmark, where the coast turns west and the greatest glaciers begin, the place where the temperate zone properly gives place to the semi-Arctic — a branch continues straight on, runs far north to the Yukon watershed, then turns west again and rejoins the other in southwest Alaska. In the course of the latter it throws up mighty peaks, the monarchs of the northern continent, including Mount Saint Elias, 18,024 feet, and Mount Wrangell, a great isolated semi-active volcano, 17,524 feet; the altitude rising as it goes west, it culminates in Mount McKinley, 20,464 feet, the highest elevation in North America.

The Eastern Mountains and the Plains.— In North America the backbone and nucleus of the continent is locally known as the Alleghany system in the northern half of the United States and the Appalachian in the southern; but for scientific purposes the latter name is commonly extended to the whole. It extends from Gaspé peninsula, between the lower Saint Lawrence and Chaleur Bay, below Quebec, through the United States to north Alabama and north Georgia, where the mountains sink down to the great coastal plain which girdles the United States from 50 to 100 miles back from the shore. Between the mountain and plain is a foothill region usually known as the Piedmont region. The mountains are a plateau from 50 to 200 miles wide and averaging 1,500 to 3,000 feet high, but with peaks rising to 6,294 feet in Mount Washington (New Hampshire) and 6,707 feet in Mount Mitchell (North Carolina). The range has many local names for the different divisions, as the White and Green, the Adirondacks, the Taconic, Hoosac and Catskill, the Alleghany, the Blue Ridge and South Mountain, the Black and Smoky, etc.

On the west they slope through rolling uplands to the most peculiar feature of the North American surface, entirely unlike any other part of the globe, the prairies (called savannahs in English books, but never in American speech): a block of undulating plains of enormous extent in the centre of the Mississippi basin, composed mainly of dark, rich loam from a foot to several feet deep over a bottom of clay, and of such composition that natural tree-growth is largely absent even where rainfall is plentiful, though grass and other crops grow abundantly. Often this will be as level as a floor for scores of miles together, and the eye sweeps uninterruptedly over a grassy ocean to the horizon. On the west of this extend to the Rockies lands often as flat as the prairies, but lacking their individual trait and called plains instead. The same features are repeated in northwest Canada from Manitoba to the Rockies. Locally they are known as the "Great Plains."

In South America the eastern chain is similarly formed of several parallel ranges following the Brazilian coast, on a wide plateau, a reduced copy of it running through the Guianas. The whole centre is an immense plain sloping sharply up to the Andes; but in place of the vast treeless flats of the northern continent there is the most enormous forest of the world, two and a half millions of square miles in extent. North of this, however, are considerable plains along the Orinoco called llanos. Below the range the country is a great grassy steppe, rather ill-watered, called pampas, and extending through Argentina and Patagonia.

Geology and Mineral Resources.— *North America.*— The North American continent may rather easily be divided into a few great geological units, the general features of which are simply and briefly stated below. These divisions may be termed the Canadian Shield, the Coastal Plain, the Eastern Highland, the Central Lowland and the Western Highland.

Canadian Shield.— The nucleus of the continent consists of a great U-shaped area enclosing Hudson Bay, and extending in the Lake Superior region southward a short distance into the United States. It also sends a long arm southward into the Piedmont region, along the east border of the Appalachian Highland. This large area consists almost wholly of highly folded Pre-Cambrian (q.v.) (Archean (q.v.) and Algonkian (q.v.)) rocks, granites, schists, quartzites, marbles, etc., of great age; and it was by the erosion of this mass, largely, that the sediments were derived to build up the other portions of our continent. Particularly in Canada, this area contains extremely valuable deposits of gold (Porcupine District), silver and cobalt (Cobalt District), and copper and nickel (Ludbury District). In Michigan it also contains famous mines of metallic copper; and in Michigan, Wisconsin and Minnesota are great iron ranges, among which the Marquette and Mesaba are the best known. The eastern part of this large region is known as the Laurentian Highland. The area as a whole is not mountainous, and consists of a rather low, dissected peneplain (q.v.), the average elevation of which is about 1,000 to 1,500 feet. It has been glaciated in comparatively recent times, and contains vast areas of swamps and thousands of lakes. Geologically the region is known as the "Canadian," or "Pre-Cambrian Shield."

Coastal Plain.— On the eastern and southern sides of North America, from the vicinity of New York southward, is a low flat plain which sweeps around the southern end of the Appalachian Mountains, and from the Gulf of Mexico merges gradually northward into the great interior plain. It is known as the Coastal Plain. Geologically it is extremely young, consisting wholly of Cretaceous (q.v.) and Tertiary (q.v.) rocks, mostly soft, unconsolidated clays, sands and marls. At a time geologically recent, this area was under the sea, and these beds were laid down as a result of the erosion of older parts of the continent. The region is so new

and so low that it has undergone little erosion, and is consequently very flat and monotonous in topography. Portions of it are rich agriculturally, where the soil is not too sandy. Owing to the unconsolidated condition of the rocks, building stone is less abundant than elsewhere. Aside from petroleum products and salt, both of which occur in quantity in the Louisiana and Texas portions of the area, the Coastal Plain is singularly poor in mineral wealth.

Eastern Highland.— This highland, extending from New England southwest to Alabama, has a base of Pre-Cambrian rocks, among which granites, gneisses and schists are dominant. Upon these rests an intensely folded complex of shales, limestones and sandstones, embracing rocks belonging to every period of the Paleozoic Era. Throughout the Paleozoic, this area was almost continuously beneath the sea, finally emerging at the close of the Era, when it was folded into a marked mountain range. Erosion has one or more times almost completely leveled away the range, and still further uplifts without folding have allowed the streams to cut away the soft layers of rock, leaving the upturned edges of the harder layers as long parallel mountains typical of Appalachian topography. To the west this folded region grades into a high plateau of flat-lying rocks chiefly of Carboniferous Age, known as the Allegheny (north) and Cumberland (south) plateaus. The chief mineral wealth of the region lies in its coal, of which the area of Pennsylvania anthracite is the most famous field. Slate, marble and granite are especially important products in the New England portion. The intensely folded area yields little oil and gas, but the flatter plateaus to the west contain the important Appalachian petroleum field.

Great Central Lowland.— With the exception of a few minor uplifts, such as the Onichitas, the Ozarks, the Black Hills, and others of lesser note, this region is a vast interior region, lying south of the Canadian Shield, and enclosed between the Eastern and Western highlands, sending a narrow arm to the Arctic between the Western Highland and the Canadian Shield. The area is one of flat-lying rocks. East of the Missouri River, these are almost wholly Paleozoic, the Carboniferous being the most wide-spread surface formations. From the Missouri River westward, Cretaceous and Tertiary rocks constitute most of the surface. It was during late Carboniferous times that most of this area permanently became land, although its western portion was again temporarily under the sea during the Cretaceous period. Topographically the region varies from almost dead level plains to sharp hilly regions, ranging from a few hundred to 5,000 feet above sea-level. The northern part has been glaciated, and swamps and lakes are abundant. As a whole the region comprises the great agricultural portion of the continent. It is the richest in coal and petroleum of any section of the country. It has very valuable lead and zinc deposits, beds of salt, quarries of building stone and other minerals of lesser value.

The *Western Highland.*—This portion of the continent is more complicated in structure and history than the areas thus far considered. It may be said to consist of a great range of mountains, the Rockies proper, on the east, to the west of which lies a broad plateau region, and beyond this the Pacific border ranges, themselves complex in structure and history. These sections will be taken up each in a separate brief discussion.

The *Rocky Mountains,* contrary to rather hazy prevalent conceptions, lie nearly a thousand miles from the Pacific Ocean, at least in the United States. They contain rocks of every age from Pre-Cambrian to Quaternary folded into ranges, rather generally trending north and south. Their final emergence from beneath the sea, and the folding which gave them their present structure, came at the close of the Cretaceous period. During the Tertiary they were the site of much igneous activity, and since their folding they have been greatly modified by powerful erosion, several minor uplifts and very recently by glaciation. Unlike the Appalachian region, there are minor areas between the numerous ranges, in which the rocks are flat-lying, or nearly so.

The *Inter-Mountain plateau,* while it contains some areas of intense folding, is more largely one of nearly flat-lying rocks, greatly modified by faulting. The rocks are of all ages from Pre-Cambrian to Tertiary.

The southern and higher portion of this large region is generally known as the *Colorado plateau.* Paleozoic rocks are exposed at a few points, but the surface formations are largely Jurassic and Cretaceous in age. The rocks are nearly flat, as a whole, and the structure is dominated by a few very large faults. Above the plateau surface, which average 5,000–7,000 feet in height, rise several groups of volcanic mountains, among which the San Francisco Peaks and the Henry Mountains are best known. The area is deeply trenched by magnificient cañons, among which the Grand Cañon is easily the foremost.

To the north and west of the Colorado plateau is that portion of the Inter-Mountain plateau most commonly called the *Great Basin.* This region stands notably lower than the Colorado plateau and is much more intensely faulted. Paleozoic formations and Tertiary lavas and lake beds are wide-spread surface rocks. The general floor of this region ranges from a few hundred to 5,000 feet above sea-level, and above this are many north and south mountain ranges carved out of fault blocks. Between these ranges are extremely flat desert floors, some of them beds of extinct salt lakes.

Still farther north this complicated basin structure has been buried beneath thousands of feet of Tertiary lavas, forming the great *Columbia Lava plateau,* many thousands of square miles in extent. This has more recently been trenched by the Snake and Columbia rivers, which have cut cañons from 2,000 to 4,000 feet in depth.

The *Pacific Border ranges* are made up of the Sierra Nevadas and Cascades on the east, and the Coast ranges on the west, with the Valley of California, the Willamette Valley and Puget Sound as lowlands separating the two systems.

The Sierra Nevada Range consists largely of Triassic and Jurassic slates, cut by great masses of granite. The range was folded near the close of the Jurassic period, since which time it has been modified by subsequent uplifts,

faulting, and very extensive erosion, with recent glaciation. To the north it passes with somewhat similar structure, under great piles of lava that constitute the numerous volcanic cones of that range, dating from Tertiary time.

The Coast ranges consist of intensely folded and faulted rocks varying in age, but probably dominantly Tertiary. Their structural history has been extremely complex. One intense period of folding came near the middle of the Miocene. There have been later uplifts, accompanied by some folding and much faulting the latter process going on even to the present time, as witnessed by the great fault responsible for the San Francisco earthquake.

The Western Highland Region, as a whole, has been one of intense igneous activity dating at least from the Jurassic, and perhaps earlier time, to the recent activity of Lassen's Peak, in California since 1894. This igneous activity is probably the one fact most largely responsible for the great metallic wealth of the region, gold, silver, copper, lead, zinc and many other minerals occurring in very rich deposits in many widely separated localities. Coal of Cretaceous and Tertiary age is also an important economic produce, and petroleum occurs in enormous quantities in California, and in lesser amounts in other localities.

South America.— The mineral belt of South America centres upon the great continental backbone of the Andes, following along the entire western coast. Other small areas add their tribute, notably the coastal uplift of southeastern Brazil, known as the great Brazilian Plateau. The territory available for profitable exploration and development is, broadly speaking, boundless. Somewhere within the region may be found every mineral having commercial value, scattered far and wide from the mother lodes by the grindings of glaciers and other erosive agencies, for South America exceeds any other part of the world in the abundance of its mineral wealth. After the advent of the Spaniards in the 16th century, Bolivia rivalled Mexico in the billions of dollars of silver taken from its mines, while a few of its mines yielded billions of dollars of gold. Hundreds of millions of dollars of gold were also extracted from the soil of Peru, Colombia, Brazil and the Guianas. At the present day, with her treasures practically untouched, South America holds several world records in the mineral market. The entire supply of the world's bismuth comes from Bolivia; by far the largest supply of thorium is furnished by the monazite sands of Brazil; the unparalled nitrate deposits of Chile supply practically all of the world's consumption of nitric acid, and practically all of its consumption of iodine. Colombia is the only considerable source of platinum outside of Russia; the tin production of Bolivia stands second on the world's tally sheets; Colombia supplies the world's demands for fine emeralds; Brazil is second only to south Africa in the production of diamonds, and for many years was first; the asphalt lakes of Trinidad and Bermudez supply the world. Coal exists in large quantities all through the Andes region. In many localities wide seams are exposed to view for long distances along the slopes and in the sides of ravines, millions upon millions of tons being in sight. Some of these coal veins come down almost to tide water — as at Paracas and near Trujillo, Peru. Good coal is found also along the coast of Ecuador; in southern Chile coal is mined extensively at Lota and Coronel, at the former place the mines running out under the sea for more than half a mile; deposits also exist in the Aconcagua region near Rio Blanco. In Colombia coal exists in many widely separated localities; good bituminous coal in the interior and lignite beds near the coast; in Venezuela there is coal of fair quality. Indifferent development of this primal commodity, however, is the cause of the retardation from which the mineral industries of South America suffer. The only considerable active oil production in South America is in the Lobitos fields of Peru. In Bolivia, however, there is an immense oil belt 150 miles long, which continues over the national boundary into Argentina to Comodoro Rivadaira. At Santander, Colombia, there is an oil area 100 miles in length and 60 miles in width, and petroleum has been found in the upper Magdalena district. A large field also exists in Venezuela near the city of Maracaibo.

Iron exists in enormous quantities and of unrivalled quality through all South America awaiting development. In the Brazilian plateau are billions of tons of ore, carrying up to 50 per cent of the metal, but coal and transportation are lacking for its successful utilization. Great iron deposits, notably at Tofo, are found in Chile. Other important deposits also exist in Colombia and Peru. Four-fifths of the world's supply of vanadium is produced by a single mine in Peru, to the extent of 3,000 tons annually. Bolivia, Argentina and Brazil furnish about one-tenth of the total production of tungsten, while the great sulphur mine at Tinguirirca, Chile, holds another record as containing the richest sulphur deposits known.

Consult reports, bulletins and monographs of the United States Geological Survey; reports of the Canada Geological and Natural History Survey; Suess 'Das Antlitz der Erde' (The Face of the Earth, Prague 1883–88), and, more particularly, the excellent version entitled 'La Face de la Terre,' translated and annotated by Emm. de Margerie (Paris 1911); Pirsson and Schuchert, 'A Text-Book of Geology' (New York 1915); Felix and Lank, 'Geologie und Paläontologie der Republik Mexico' (Leipzig 1890); Steinmann, 'Sketch of Geology of South America' (in *American Naturalist,* Vol. XXV, 1891); Mill, 'International Geography'; Russell, I. C., 'North America.'

Climatic Conditions.— In a continent practically spanning the entire space from pole to pole, every variety of climate may be inferred; and with every elevation from sealine to everlasting ice even in the tropics, each latitude is sure to contain as endless varieties in itself. In both North America and Asia the western side is both warmer and of more even temperature than the eastern, owing to ocean currents generated in the tropics and flowing eastward, the Gulf Stream through the Atlantic, the Kuro Shiwo through the Pacific. The Rockies, however, give a peculiar character to western North America, to be mentioned later, and even in interior Alaska the isotherms rise — the parallel of Dawson City in the Klondike is that of the north end of Hudson Bay and far into south Greenland. The eastern side of both continents has about

the same climatic belts: China corresponds fairly to the United States, and Peking has a climate not unlike Boston. But if we compare eastern North America with Europe, and to a less extent South America with the East, the leading trait is its greater cold in every zone from just below Great Bear Lake; Petrograd and Christiania are on a level with the southern tip of Greenland. Sitka has much the same parallel as Aberdeen; Copenhagen and Moscow, Glasgow and Edinburgh, correspond with central Labrador, northern James Bay and some distance north of Lake Winnipeg. All the British Isles, all the Netherlands and the greater part of Germany, are north of the city of Winnipeg, which itself is about on the parallel of Paris; Saint Paul and Ottawa correspond to Bordeaux, Turin and Bucharest, centres of wine and roses; Boston and Chicago to Rome, New York to Naples; Philadelphia is south of Madrid and Constantinople; Washington corresponds to Lisbon and Corfu, Saint Louis to Athens. The thirtieth parallel is about that of New Orleans and the Isthmus of Suez; the twentieth passes through the heart of Mexico, also just below Calcutta and Mecca, and through the Sudan and Sahara; the tenth through Venezuela, also through Guinea and just above Ceylon. The equator touches Quito and the mouth of the Amazon, and also divides Sumatra and Borneo and Lake Victoria Nyanza; the Amazon and the Kongo traversing about the same zones. Even allowing for the elevation of the Mexican plateau, the temperatures of India and of the deserts of Arabia and Africa cannot be paralleled even on our tropical coasts. The difference is due to environing conditions and internal structure combined. Above the European mass is a partially thawed sea; above that limit in America lie many hundred miles of ice-clad land masses, while to the northeast is the continental mass of ice-capped Greenland, piercing deep into the eastern side the polar inlet of Hudson Bay. But a partial cause is the mountain framework which in Europe lies mainly east and west and in America north and south. In the latter, therefore, what is practically one long plain stretches from the Arctic Ocean to the Gulf of Mexico, the polar winds finding no obstruction as they sweep southward. There is not a spot in North America east of the Rockies absolutely secure from intense frosts; and there are no definite north-and-south climatic belts, the only sharp divisions being those east and west of the Rockies. In Europe and west Asia, on the contrary, where the mountains cut off the polar winds, the climate will often vary from north-temperate to semi-tropic within a score of miles. This isolation of different parts, giving the most varied lives and habits time to grow into deep-set racial distinctions, has produced by their varied strains and interaction the splendid civilization of the Western world; while the two great plains which fill the centre of each continent, linked by a fertile and temperate plateau, in itself the most tempting of all, gave no opportunity for differentiation, and the undiversified monotony of a single racial stock and culture was one of the influences which kept progress at a spot reached by European races thousands of years before.

Rainfall and Natural Sections.— The habitability of a land outside of Arctic regions depends first upon its water supply and secondly upon its disposition. The prevailing winds which supply the rainfall of all countries by the ocean vapors they carry blow nearly east and west, the easterly called specifically "trades," the westerly "anti-trades." The eastern continent has its greatest length in this direction and a great mountain wall on the east; hence much of central Asia lying beyond the reach of vapors remains a permanent desert. America, from its narrowness and its sides being toward these winds, is much more easily supplied. The Great Lakes add to the rainfall in their region; the Gulf of Mexico, as will be demonstrated, turns the whole east centre from a potential desert to a garden; and the only entire deserts are between two arms of the western range in the northern part and some portion of the strip along the western coast of the southern.

In the polar regions the cold and physical conformation make the water supply of little avail. Northern Alaska and northern Canada are flat, spongy moors but half reclaimed from the ocean, with permanently frozen subsoil, thawing slightly in the brief, intense summer (sometimes of 120°), and developing a few mosses, grasses and weeds, with dwarfed shrubs and clouds of mosquitoes. (See ALASKA). But the distance southward to which Arctic conditions extend is far greater on the eastern coast than the western, owing to the effect of the Rocky Mountain wall in breaking the force of the polar winds, and of the warm ocean vapors; the latter also make the temperature far more equable. The midwinter Arctic temperature of 50° and below has no representative on the western coast. The Labrador coast, latitude for latitude, is 20° colder than the Alaskan in mean annual temperature, about 20° against 40° even in the extreme northwest; and its mean midwinter temperature 30° colder, —25° against 5°. Even from the interior to the western coast the isotherms rise astonishingly; that of north Virginia at lat. 40° N. is that of British Columbia at 50°. On the other hand, the range of temperatures is much greater on the east, the temperature rising pretty steadily as we go southward, to 80° mean annual on the Mexican Gulf coast, a range of 60° from semi-Arctic to semi-tropic, while in the corresponding part of southern California it is only 70°, a range of 30°. The midwinter range is over 100° on the east coast, not above 50° on the west; the midsummer is 40° in the east, not over 20° on the whole coast from southern California to Bering Sea. Much greater extremes still are found in the Cordilleran region, where the mean annual embraces a scale of 60°, and the mean midsummer runs from 40° to 95° in southern Arizona and northern Mexico, while the thermometer rises to 120° at times, as at Fort Yuma and similar places.

From about lat. 52° N. to perhaps 44° in the interior and east, the climate, though not quite fatal to civilized energies, is very severe, with winters of seven or eight months and summers at best but short and not always calculable, though rising to 100° and over in waves; with sudden intense "northers" and "blizzards" of intense cold with fine dry snow sometimes paralyzing business activities for days. The dry atmosphere, however, makes it less trying than the damper though somewhat warmer eastern weather; it has developed great cities and popu-

lous States in the United States and flourishing communities in Canada above 50°; and the industrial and intellectual future of the region is as promising as that of any part of the continent. There is not much difference between the central and eastern parts in this respect, Duluth and Quebec, Saint Paul and Ottawa, corresponding closely in parallels and nearly in climate. Northwestern Canada and the northern central States of the United States form the great cattle and wheat district of North America; and this on both sides of the Rockies is the chief timber section. South of this is the great "temperate" section, shading into the semi-tropic by imperceptible degrees, but which in the United States may be roughly divided by the basin of the Ohio. The northern portion has summers and winters of the same general character as the former, but less intense at either extreme, neither hot waves nor cold waves usually lasting long; the weather damper than in the farther north. It is the chief region of Indian corn and apples, hay and potatoes, etc. The southern half shows the beginnings of tropic elements in the seasons, which are not so much winter and summer as wet and dry; in the luxuriance of vegetation and characteristically tropic varieties; in the less bracing atmosphere and in the bottom lands its languorous oppressiveness; in the domestic architecture, where the obvious desire is to escape heat rather than to ward off cold; and in the productions, such as cotton and tobacco, rice and sugar, sweet potatoes, and oranges in the far south.

The Pacific slope, however, is an exception to this, its climate resembling the western coast of Europe much more than the eastern of its own. All the isothermal lines curve sharply northward west of the mountains. From Puget Sound to San Diego there is no extreme range of climate, no such division into quasi-Arctic and quasi-tropic as on the eastern slope; though the northern part from its heavy rains is the greatest timber region of the continent north, and the southern a great country of vineyards, almond orchards and other south-temperate products. California reaches from about the parallel of Boston to that of north Georgia and Mississippi, but has neither the raw, harsh New England climate nor the heavy southern atmosphere, and southern California is a noted warm sanatorium. The high arid plateau of north Mexico experiences extreme alternations of temperature, from 95° to 40°; but on the coasts and below the great Anahuac table-land the region becomes semi-tropic. Sugar-cane, cotton and coffee now ascend to the lower mountain regions, and in their place, at sea-level, appear pineapples, bananas, etc. Central America from its narrowness and low elevation has an island climate, tropic and pestilential on the shores and along the streams, moderate and healthful on the higher ground in the interior. This and the Antilles are the region of sugar, indigo, cochineal, ginger, vanilla, capsicum, etc. South America, lying on both sides of the equator, has in the central and eastern parts a much less range of climate than North America, the greatest in a single section being found in Argentina, where it is some 30°; over the whole continent the mean annual temperature ranges from 80° to 40°, the midwinter (our midsummer) from 80° to 35°, and the midsummer from 85° to 50°; north Argentina, the Cordilleran section, having, as before, the greatest alternations. The southern west Andean slopes are cooled and equalized by the west winds from the ocean; the northern parts are a tropic desert; but on the different levels of the range are found every climate of the earth from tropic to arctic. The tropic productions and characteristics south of the equator, except as deflected by local conditions, are much like those north of it. The zone reaching south as far as lat. 40° S. has a mean temperature of 71° in the warmest and 53° in the coldest month. There the palm still thrives on the lower basin of the La Plata beside the mulberry and indigo; the pampas and the west coasts of Chile are characterized by beautiful araucarias (the pine of the southern hemisphere), by beeches and oaks, the potato and the arrowroot. The plants in cultivation are a curious blending of the vegetation of the northern and southern United States: wines, olives, oranges, hemp, flax, tobacco, wheat, Indian corn and barley. The southern limit of the periodical rains reaches as far as lat. 48° S., when the mean temperature of 59° in the warmest and 39° in the coldest month still favors the growth of cereals, and on sheltered spots of the west coast the growth even of the vine and the finer fruits. The zone reaching to the southern extremity of America shows comparatively little difference between the warmest and coldest month, the mean temperature of the one being 41° and of the other 25°; but the low degree of summer warmth produces a marked change in the form of vegetation which now presents only a few trees, as the beech and birch, and an extraordinary abundance of mosses and ferns. As in passing from the equator to the pole the region of the vegetable world gradually declines, so in climbing from the tropical shores to the ice-covered mountain summits three different climates have been distinguished by the names of *tierra caliente*, *templada* and *fria* (hot, temperate, frigid). Of these the *templada* extends over those healthy and beautiful regions where a kind of perptual spring prevails, and green pastures and noble forest trees are found united with the fantastical and gigantic forms of the tropics.

The question of rainfall is difficult to group systematically with that of climate. The mass of the northern continent is in the region of the anti-trades or prevailing westerly winds. The Japanese Black Current, the Gulf Stream of the Pacific, running northeast and striking the polar currents and the cold shores, icebound for many hundreds of miles, sends up a great steam of fog which is blown against the wall of the Rockies and sent back by them upon their western slope in a rainfall from 50 inches up to 100 or even more, that makes the northern coast from southern Alaska to northern California one gigantic forest of immense timber. The rainfall on Puget Sound is from 75 to over 100 inches in winter and the annual average on the Pacific coast of Alaska is 90 inches. In the southern part, along southern and Lower California, the Cordilleran region above the Gulf and west Mexico, the same winds blow; but the land is too warm to cool and precipitate the vapors to the same extent; and such precipitation as there is takes place mostly on the

crests of the coast ranges, the Cordilleran region being mostly semi-desert or wholly so. In the summer the coast ranges are too warm to retain all the moisture of the vapors, which therefore give a little at these seasons, 10 to 20 inches in all, to the interior regions.

The Mississippi Valley is saved from becoming the most tremendous desert on earth, a second Sahara, by the Gulf of Mexico and the western wall combined. If it had to rely on the Pacific winds it would be utterly rainless; but these westerly winds in the Gulf region set up whirls of cyclonic disturbance which make an easterly eddy, carrying saturated currents in that direction; and these, striking against the Rockies, are turned northeastward through the central and eastern valley, giving it abundant water. This eastward set, however, leaves the western valley only the edge of its course; the far western, as in western Kansas and Nebraska, being rainless for considerable periods and scantily supplied at best. The rainfall ranges from 60 inches on the coast to 30 around the Great Lakes. The same cyclonic movement makes the same easterly eddy in the Atlantic, and the Atlantic coast receives its 40 to 50 inches a year from that source.

Central America is in the region of the trades or easterly winds and is so narrow that its climate is that of a semi-tropic island. In this region the rainfall is enormous, creating heavy tropic vegetation and increasing to 200 inches at Panama and the northwestern shores of South America, short rivers like the Atrato carrying almost a continental volume of water. All tropical South America is within the trade-wind belt, its moist warm climate creating the enormous forests of the Amazon basin, the oceanic volume of that "river" (rather a huge set of parallel drainage channels in one vast swamp) and its tributaries, and the lesser but still mighty Orinoco. On the western slope of the Andes this portion receives no vapor and is a desert down to north Chile. But in central and south Chile and Argentina the anti-trades begin once more, and North American conditions are repeated: the westerly winds giving to that coast a mild, equable temperature and heavy rainfall, while the Andes bar nearly all the moisture from the east, and the great southern plains or pampas are a relatively arid steppe.

Taking the continent as a whole, the rainy zone is disproportionately extended in America; and as it stretches over all the zones, the vegetation is remarkably diversified, from the lowly moss of the north to the lordly banana of the tropics. The giant chain of the Andes everywhere rises above the snow-line. From the sterile Peruvian coast, burned by tropical heats, one can look up to summits covered with perpetual snow and ice; and one may climb from the gigantic equatorial vegetation of Quito to heights where only the condor testifies to the existence of organic life as he wings his flight over snow-fields and glaciers. In Peru the culture of cereals is carried on at the height of 12,000, and near Quito at 9,000 feet.

The north and south of America have the same length of day; but in the seasons which depend not merely on astronomical but on a variety of local causes, the analogy does not hold and very remarkable discrepancies appear. Thus, for example, the east coast of Brazil has the rainy season from March to September, while Peru, lying under the very same latitude, has it from November to March. Within the tropics the transition from the rainy to the dry season takes place almost instantaneously; but in receding from the tropics on either side the change of seasons becomes more and more gradual till at last, in the polar zones, nature, bound in icy chains, affords for living existence only a short awakening out of a long winter sleep.

Consult publications of the United States Weather Bureau, the Canadian Meteorological Office and the Mexican Weather Service; Greely's 'American Weather' (1888).

Flora.— The sections of cultivation have been dealt with already, and we shall consider here only the indigenous features. From north to south the general succession is as follows:

The surface-thawed Arctic tundra bears only reindeer-moss, blossoming weeds in its brief hot summer, and dwarf willows. From about the Arctic Circle to the southern coast of Alaska, James Bay and the North Sackatchewan, we find shrubby plants, most of them yielding berries; then the universal wood-of-all-work, the famed "Alaska spruce," with clumps of birch and alder: these at first sparsely, then forests of conifers,— larger spruces, pine, hemlock and fir. This coniferous growth extends in enormous volume down the cool, wet Pacific slope to central California; the giant redwoods and sugar-pines, etc., and the huge sequoia, the largest and oldest plant on the earth, being famous everywhere. Eastern Canada is forested with similar coniferous species; so is the United States through Michigan, Wisconsin and west to Minnesota, to southern Missouri and northwestern Arkansas, and to northeastern Texas and the Indian Territory. The central United States has predominant deciduous (hardwood) trees, such as the oak of many varieties, the beech, maple, elm, chestnut, black walnut, hickory, ironwood, pepperage, red mulberry, etc. In the southern States the yellow pine holds foremost place. The characteristic forms of the Southern States are the magnolia, palmetto, tulip-tree, plant-tree, pecan, etc., with the cypress everywhere in the swamps. The Cordilleran woods are chiefly conifers on the mountains; on the plains and in the valleys are the yucca, cactus, etc., whose dense, thorny growth is termed chaparral. The wild picturesqueness and even grotesqueness of the cactus forms is noted; and it furnishes food for animals that would otherwise starve on the arid steppes. The north Mexican plateau has little wood except on the mountains. Southward vegetation blends with the tropical forms, and in Central America and the Antilles the most valuable trees are the mahogany and boxwood, and of vegetable products vanilla and ginger.

In South America there is no Arctic region; but the great differences in altitudes and the water supply give it a wide range of native production. The immense rainfall and steady tropic heat of the north shore along the Caribbean and in the Magdalena Valley create a profuse tropical flora on the lowlands, changing to palms, bamboos, tree-ferns, etc., on the higher levels, and coniferous trees on the mountains. Along the Orinoco the llanos, plains with immensely tall grasses and great single trees, take

the place of forests. The vast selvas or swamp forests of the Amazon occupy the heart of the continent. These colossal tropic jungles, often formed into an almost impenetrable web by multitudes of creeping and climbing plants, contain an almost unexploited variety of magnificent trees with the most beautiful ornamental woods,— as rosewood, cocabola, etc.,— products like india-rubber, brazilwood for dyeing, cinchona for medicine, etc. Dense forests of cinchona overshadow the mountain terraces of Quito. South of the selvas are the forests of Matto Grosso, the great Brazilian province east of Bolivia; south of this again, and of the Bolivian Cordillera, is the Gran Chaco, or "great round-up," from the Paraguay to the Andes,—a region of three to five hundred thousand square miles, largely plains, but with heavy forests including the wax-palm, and with tree-like thistles on the lower plains. Now begin the pampas of the lower La Plata, which are fine grassy plains in the northern part, but in south Argentina and Patagonia become semi-arid steppes. The western strip has already been dealt with.

Consult Gray's 'Synoptical Flora of North America' (1886–97); Heller's 'Catalogue of North American Plants North of Mexico' (1900; Sargent's 'Silva of North America' (1890–91); Britton and Brown's 'Illustrated Flora of the Northern United States, Canada and the British Possessions' (1896–98); Berg's 'Physiognomy of Tropical Vegetation in South America' (1894); Rusby's 'Enumeration of Plants Collected in South America' (in *Torrey Botanical Club Bulletin*, Vols. XV, XX, XXII, XXV, XXVII).

Fauna.— The distribution of animal life in America proves by itself what was probable on geologic and physiographic grounds, that the proper division between the two continents is not at the Isthmus of Panama, but at either Nicaragua or Tehuantepec, and that the junction was relatively late. Zoologically considered South America includes also not only Central America and the Antilles, but the Mexican plains and coasts east, west and south of the plateau of Anahuac. The faunæ of the two continents have almost no common feature. Furthermore, the North American species are in many respects closely allied to the North Asiatic, while the South American mammalia and birds have but slight affinities to those of any other section of the world, and those of the most general kind, fully four-fifths of its species being unknown outside its own limits. North America, with this proviso, in Sclater's and Wallace's classification, is Palæarctic in the Arctic regions and for some distance south of the northern ocean and west of Hudson Bay, and Nearctic through the rest of its bulk; while South America, thus extended, is Neotropic. Some authorities, however, from the close affinities of the first two, group them together into one as Holarctic or Triarctic.

In North America, for instance, the fur animals are not very different from the Siberian kinds; the reindeer, moose (called elk in Europe) and bighorn are closely akin to Asiatic congeners; the bison belongs to the buffalo family; the cat family is represented by the panther and wildcat; the wolf family by various classes of wolves and probably by the Eskimo dog; the bear family by several distinct sorts. The white goat has close foreign relatives; so have the beaver, marmot, rabbit, squirrel and most of the other rodentia, the weasels, insectivora, bats and others. The birds, reptiles and amphibia are nearly all identical in family with Old World groups and often in species. The fresh-water fish and mollusks of the cold regions of both are generally akin and sometimes the same, though in the great rivers of the southern half many new forms have developed, the river mollusks being much more numerous and specialized in the United States than in any other part of the world. But there are very notable individual forms. The North American "great cat," variously called panther, catamount, cougar, puma, mountain lion, American lion, etc., has long been specialized in this region; the musk-ox and the skunk are our own, as are the pronghorn and the gopher. And there are still more striking absences where all analogy would lead us to expect strong representation. The horse, camel and rhinoceros originated in North America as late as Tertiary times, but have entirely disappeared. There is but one marsupial, the opossum, no antelopes, and but one genus of native swine (in Texas and Arkansas).

South America shows a new world. Out of 10 orders of mammalia with 33 families which it contains, 13 families are confined exclusively to it. All its families in two orders, the Primates (monkeys) and Edentates (armadillos, sloths and ant-eaters), are its own, and five of its nine families of rodents; while of the *Chiroptera* (bats), one family, the *Phyllostomidæ*, which includes the vampire bats or blood-suckers, is peculiar to it. Its deficiencies are equally notable, though less so in some respects than of the northern continent, as it lacks norie which originated there. The horse family group is represented only by the tapir, the ruminants only by the llama and the bears only by the Andean bear of Chile and Peru. There are no Ungulates but a small deer and one genus of swine, no members of the weasel or civet families and only two small genera of insectivores. The birds, instead of having a wider range as might be thought, are still more individual: 23 families, including hundreds of genera, are exclusively South American, while only three out of its 118 genera of humming-birds, one of its 43 genera of tanagers, eight of its 70 genera of tyrant flycatchers, one of its 14 genera of macaws, four of its 13 genera of pigeons, one of its 12 genera of *Cracidæ* (curassows, etc.), two of its 11 species of goatsuckers, etc., have any habitat beyond itself. Of its wading and swimming birds, 18 of its 24 genera are peculiar to it. The reptiles are much less specialized, only four out of 60 genera being entirely individual, and those of lizards; the species, however, are more peculia. than this would indicate, the boas and scytales being distinctively South American, and the iguana practically so, though known somewhat north of this region. The waters naturally are much less specialized. Of the amphibians only three out of 16 genera are local. The fishes have four families and 17 genera, of which one family with its one genus, and a genus of another, are peculiar to the South American, the resemblances being mainly to the African families. The sirenoids represent extremely ancient forms. The insects are also not so different in form as might be anticipated. But this view understates the specific

variations, for South America is a zoological land apart.

Consult 'The Standard Natural History' (Boston 1885); Wallace's 'The Geographic Distribution of Animals' (1876); Merriam's 'Geographic Distribution of Life in America' (in *Proceedings of the American Biological Society*, Vol. VIII). For special portions, Cope's 'Crocodiles, Lizards and Snakes of North America' (in United States National Museum Report 1898); Apgar's 'Birds of the United States' (1898); Beebe's 'Our Search for a Wilderness' (1910); Edwards' Butterflies of North America' (1868-88); Goode's 'American Fishes' (1888); Zahm's 'Through South America's Southland' (1916).

Political Divisions.— The independent States of both North and South America are all republican in government, though it was only in 1889 that Brazil became a republic. The continent is politically divided as follows:

INDEPENDENT REPUBLICS.

North America —	Capitals.	Sq. m.	Pop. 1915
U. S. Proper	Washington	3,026,789	100,264,485
Alaska	Sitka	590,884	68,000
Hawaii	Honolulu	6,449	232,856
Porto Rico	San Juan	3,435	1,118,016
Canal Zone		474	75,000
Virgin Islands		142	32,000
Total		3,624,173	101,790,353
Mexico	Mexico	767,097	16,000,000
Central American States —			
Guatemala	Guatemala city.	48,290	2,119,165
Honduras	Tegucigalpa	46,250	600,000
Salvador	San Salvador	7,325	1,700,000
Nicaragua	Managua	49,200	600,000
Costa Rica	San José	23,000	411,000
Panama	Panama	32,380	450,005
Central America —Totals		206,445	5,880,170
Cuba	Havana	44,164	2,383,000
Haiti	Port au Prince	10,200	2,000,000
Dominican Rep.	Santo Domingo.	19,325	700,000
South America			
Colombia	Bogotá	438,436	5,500,000
Venezuela	Caracás	393,976	3,000,000
Ecuador	Quito	116,000	1,500,000
Peru	Lima	680,000	4,500,000
Bolivia	La Paz	560,000	2,300,000
Chili	Santiago	292,419	4,000,000
Argentine Republic	Buenos Ayres	1,153,418	9,000,000
Uruguay	Montevideo	72,210	1,300,000
Paraguay	Asunción	121,973	800,000
Brazil	Rio de Janeiro.	3,292,000	24,300,000
South American Republics — Totals		7,120,432	56,200,000

EUROPEAN DEPENDENCIES.

British —	Capitals.	Sq. m.	Pop. 1915
Dom. of Canada	Ottawa	3,603,910	7,206,643
Newfoundland	Saint Johns	42,734	243,576
Labrador (dept. Newfoundland)		120,000	3,998
Bermudas	Hamilton	19	19,935
British Honduras	Belize	8,598	40,458
Bahamas	Nassau	4,404	57,241
Barbadoes	Bridgetown	166	173,359
Jamaica with Turk's, Caicos, etc	Kingston	4,424	864,864
Windward Islands	Saint George's	528	167,809
Leeward Islands	Saint John's	715	127,193
Trinidad	Port of Spain	1,750	312,803
Tobago	Scarborough	114	21,400
British Guiana	Georgetown	89,480	304,149
Falkland Islands	Stanley	6,500	3,223
British — Totals		3,883,342	9,546,651
French —			
St. Pierre	Saint Pierre	10	5,700
Miquelon	Saint Pierre	83	550
Guadeloupe, etc	Basse-Terre	687	212,430
Martinique	Port de France	380	185,385
French Guiana	Cayenne	34,060	49,009
French — Totals		35,270	453,074

EUROPEAN DEPENDENCIES — Continued

Danish —		Sq. m.	Pop. 1915
Greenland (colonial portions of)			
Danish — Totals		46,740	13,500
Dutch —			
Curaçao (Totals, including all the other Dutch West India islands)	Willemstad	436	54,469
Dutch Guiana	Paramáribo	49,845	86,233
Dutch — Totals		50,281	140,702

The foregoing table shows, for America as a whole, though with the omissions mentioned at the beginning of this article, an area of 15,807,404 square miles; the number of inhabitants in 1916 appears as 186,106,036. It must be understood that these figures are, from the very nature of the subject, approximations only, and that the utmost care and diligence cannot produce at present (when great regions of both North and South America remain still unsurveyed, and in part still unexplored) figures of areas, etc., which should be called "exact." Most earnest efforts have been made, however, to reduce the margin of error and to secure as nearly as possible essential accuracy.

FORREST MORGAN,
Connecticut Historical Society.

AMERICA, CENTRAL. See CENTRAL AMERICA.

AMERICA, Discovery and Colonization of. The effective discovery of America was a gradual process, made possible by the first westward voyage of Columbus across the Atlantic and developed by attempts to determine the relation of the lands thus encountered to the Asiatic continent. The body of legends concerning European or Asiatic contact with America prior to the 15th century bears witness only to a vague impression of or conjecture at the existence of land in the western part of the Atlantic Ocean, which led to nothing effective in the way of confirmation of such conjecture or occupation of the territory. The contact by the Norse colony in Greenland in the 11th century with the shores, probably of New England, which the Northmen knew by the name of Vinland, led to nothing more than occasional resort to certain of its facilities such as timber, and cannot be regarded as a discovery in any complete sense. Nothing can detract from the unique distinction of the expedition of Columbus in 1492. The cosmography of his time was in error as to the size of the earth and consequently underestimated the distance intervening between the western limit of Europe and the eastern shores of Asia. But this error could in the nature of things only be brought to light by an actual test by a westward voyage across the Sea of Darkness. This test it is the sufficient glory of Columbus to have furnished and its importance for cosmography cannot be overestimated. Nevertheless, in its relation to America alone, discovery in the complete sense was rather made possible, than achieved by Columbus.

It was under the auspices of the Atlantic States of Europe that development of the results of this voyage was carried on, and of these Atlantic States, Spain and Portugal at first took the leading part. At the time of Columbus' great voyage, Portugal had nearly completed the development of the possibilities

of an eastward maritime route to the Oriental trade regions, the goal of maritime endeavor. The Spanish patronage of Columbus naturally led the Spanish Crown to claim for the westward approach to the Indies, thus made possible under its auspices, the same advantages which papal action had secured for Portugal in connection with the eastward route. By a papal bull of 25 Sept. 1493, superseding those on the subject previously issued, enterprise upon the ocean was declared open to both Spain and Portugal, with the understanding that Spain should refrain from infringement upon the Portuguese monopoly of the African coast by using only the westward approach to the Indies. By the Convention of Tordesillas, 7 June 1494, the line 370 leagues west of the Cape Verde Islands was set by the two nations themselves as a division between their respective areas of maritime activity.

Spanish voyages between 1493 and 1502 now skirted most of the island and continental shores of the Caribbean Sea and the Gulf of Mexico, without, however making much progress in elucidating the connection between these regions and the Asiatic continent, with which they were still somehow supposed to be connected. In the meantime, by the Cabral voyage to Brazil in 1500 and those of the Cortereals to Labrador and Newfoundland in 1500–02, Portugal found an interest in westward voyages, for she claimed that not only Brazil, but also the regions in the vicinity of the fishing grounds in the north, were east of the line of demarkation. The expeditions of Vespucius, Coelho and Jaques, 1501–03, not merely satisfied Portuguese curiosity as to the extent of their possessions accessible by the westward voyage, by establishing the southwestern trend of the Brazilian coast, but, what was very much more important, by establishing the continuance of this land mass to a point as far south as the latitude of the southernmost point of Africa, practically ensured the conviction that here was a New World. This was a land mass, insular or peninsular in its connection with Asia on the north, of such extent as practically to constitute a part of the world co-ordinate with Europe, Africa and Asia. It was to the New World, as thus conceived, that the name America, perhaps a little more than half seriously, was proposed by friends of Amerigo Vespucci in 1507, to be applied, and the name thus applied was but very gradually extended, as the truth became known, to the whole double continent. Spain's great efforts in exploring voyages, as distinguished from land expeditions into the interior, were now concentrated upon the search for a strait through, or a passage to the south of the lands revealed by the voyages since 1492. This was in response to the epoch-making voyage of da Gama in 1497. More accurate acquaintance with the extent of the Asiatic continent developed by Portuguese activities in the Far East subsequent to the voyage of da Gama was a favorable condition for such attempts as the Spaniards were making, and the voyage of Magalhaes in the service of Spain in 1519–22 to the south of the New World revealed the extent of the waters lying between it and the Asiatic continent. This was a fundamental fact, knowledge of which was in large outline logically sufficient to establish the separate continental character of the territory brought to knowledge since 1492. Appreciation of this significance of Magalhaes' voyage was slow in developing, however, and it was not until after exploring conquests of the western shores of the continent from bases on the eastern shore, like the conquests of Mexico and Peru by Cortez and Pizarro in 1519–21 and 1531–33, Almagro's and Valdivia's Chilean expeditions in 1535–40, and expeditions like those of Cortez and Alarcon and Coronado to Lower California and up the Colorado River in 1526–40, that the outline of the continent on its western shore was traced out as far as southern California. The coast north of this region was reached and effectively made known only by a succession of voyages covering a considerable space of time and headed by representatives of different nations. Most prominent in this enterprise were the expeditions of Drake in 1577–80, which probably reached the northern California coast; Bering, the Russian, in the strait bearing his name and on the Alaskan coast, in 1741, and Vancouver on the coast of what is now British Columbia in 1792. The eastern shore of the continent — unless we include the voyage of Gomez from Labrador to Florida in 1525, which was not followed up — was outlined by Spain only as far north as Chesapeake Bay, the remainder being the scene of French and English activity after the Spanish power was becoming embarrassed in Europe.

After the voyage of Magalhaes in 1522, Spanish interest in the New World concerned itself rather with the task of exploring the interior of the regions whose boundaries Spanish voyages had skirted, than with further extension of the lines of inclusion. The glittering success of Cortez in Mexico in 1519–21 was responsible for many attempts in imitation of such an achievement, and in the course of these attempts much knowledge was attained of the conditions in the interior of the continent. Pizarro's conquest of Peru led on to the exploration and attempted conquest of Chile and to the crossing of the Andes and the descent of the Amazon by Orellana in 1541. The La Plata system was explored by Sebastian Cabot and Diego Garcia in 1527–30. In the northern continent, Florida had been discovered by Ponce de Leon in 1512 and proved a part of the continent by Pineda, who also made acquaintance with the Mississippi in 1519. In the course of the wandering of such parties as those led by de Leon, Narvaez, Cabeza de Vaca and Coronado from 1512 to the middle of the century, much of the interior was seen as far north as the Missouri and Ohio systems, but only the extreme southeast and southwest portions, that is, California and Florida, saw any attempt by Spain to occupy the territory thus wandered over. The task of administering and exploiting what she already had was sufficient to absorb what energy could be spared from European occupations.

France and England, in the meantime, were becoming less and less inclined to respect the claims of Spain in any direction not backed up by present physical force, and more and more inclined to take up a line of aggression in maritime endeavor, not only for the sake of weakening the general position of Spain, but also because of the stirrings of individual enterprise within their own populations. It was only

under these circumstances that England began to make use of the claim based upon the Cabot voyages of 1497–98. Conditions inclining the government to a policy of respect for the claim of either Spain or the Pope were now wholly changed, and as against any right to territory west of the line of Tordesillas, England pursued the policy that occupation must, within a reasonable time, be added to discovery to constitute a valid title to territory in the New World. According to this criterion, the achievements of England and France in the 16th century can only be regarded as preliminary or preparatory in character. In each case internal strife at home and the exigencies of the European situation prevented the achievements of discovery and incipient settlement from being followed up. Nevertheless they served to reveal in an effective way that portion of the continent in which conditions for transplantation of European institutions and life were most favorable. The stretch of shore left unoccupied was comparatively small and the great work of France was extensive, and rapidly spread over the interior accessible by water-routes from the shore. While England's great work was the permanent and slow-expanding settlement of the strip between the coast and the mountain-barrier of the Alleghanies.

In 1524 Verrazano, a Florentine in the service of France, coasted from North Carolina to Newfoundland, and in 1534–41 the first French attempt at settlement was made under Cartier and Roberval, and though it was not at this time maintained, the foundation was thus laid for the French claim to the territory of the Saint Lawrence system. Attempts to invade the undoubted sphere of Portugal by Villegagnon in Brazil in 1555, and of Spain by Ribaut and Laudonniere in Florida and South Carolina in 1562, were promptly suppressed. So that when, at the beginning of the 17th century, Frenchmen were in a position to take up transatlantic activity once more, the Saint Lawrence Basin naturally became the scene of their endeavors. From Port Royal in Nova Scotia in 1603, headquarters were shifted in 1607 to Quebec, and once established at one end of the great interior waterway system, and headed off from southward expansion by the hostility of the Iroquois, the line of least resistance led naturally to the interior by the west. These circumstances, coupled with the character of the emigrating population, account for the most signal achievement of the French in the New World — exploration of the continental interior. This went on coincidently with the process of colonization and thereby a fundamental characteristic of New France on the mainland was illustrated — the attempt by the government to nourish a true colony in eastern Canada, while the adventurous population, missionary and fur-trader overran the surface of the great interior. Trails were made by Nicollet in 1634 as far as the Illinois country by the Lakes and the Fox River route, by Radisson and Groseilliers in 1658–59 as far as Lake Superior and the Hudson's Bay region, by Joliet and Marquette in 1673 to the Mississippi. And by 1682 La Salle had opened up the connection between the Gulf of Mexico at the Mississippi's mouth and the Gulf of Saint Lawrence. By 1699 a French settlement was planted in Louisiana and in 1718 New Orleans was founded.

With England, the order of proceedings was different. Exploration of new regions was a preliminary to their filling up with settlers and bursts of exploring activity occurred in the intervals of the great stages in the process of colonization. The Cabot voyages gave her the basis of the claim to the continental shore to the north of Florida, but her first exploring activities were in connection with the search for the northwest passage to the Orient by such commanders as Davis and Forbisher in 1576–78 and with the attempt to occupy Newfoundland by Gilbert in 1579. With the career of Raleigh, the English maritime enterprise takes definite beginning in the colonizing line with the attempt at Roanoke in 1585, and from then till well into the 18th century English exploring activity was mainly concerned with the coast between Florida and Newfoundland, the basis of her colonies on the main. This was as characteristic of the English career in the New World as the French method of rapid and extensive spread from an undeveloped base. In the course of occupation of the coast, the English found themselves preceded in the strategic regions of the Hudson and Delaware valleys by the Dutch, and falling back on the principle of prior discovery alone, which, as against Spain, she had disregarded, made conquest of the New Netherlands settlement in 1664, as an invasion of the right to the whole, claimed by virtue of the Cabot voyages. British interest in the interior awoke in the 18th century, and, mostly under colonial leaders, British hinterland was extended to a hostile contact with the French claims to the interior based on discovery and exploration of the Saint Lawrence system. This being settled by the elimination of New France from the continent in 1763, English exploring activity found its scene, after the separation of the seaboard colonies with their westward extensions to the Mississippi, in the extreme northern part of the continent, with the territory of the Hudson's Bay Company as the base. Here in the later years of the 18th century the early expedition of Verendrye to the Canadian Rockies by the Saskatchewan in 1741 through the interior of the Canadian Northwest was followed up by Hearne in 1770 and Alexander Mackenzie in 1789.

The areas of the New World within which the colonizing activities of the European Atlantic States were carried on conformed in a general way to the scenes of their earliest contact and activity. Portuguese colonization in the New World was limited to Brazil, the only portion of the continent within the limits marked out by the line of Tordesillas. Spanish activity radiated from the Caribbean archipelago in all directions and included the greater part of habitable South America, Central America and the southern portion of the North American continent. French colonies were to be found among the West Indies, but the greatest extent of French settlement was in the neighborhood of the Saint Lawrence system, while the English, late comers as they were, occupied strategic points among the islands and stretched along the continental shore from Florida to the Kennebec.

In the list of participators in the work of

colonizing the New World there must be added to the European Atlantic States already mentioned as conspicuous in discovery and exploration, Holland and Sweden. But the brevity of the duration of these attempts hardly entitles them to a place of equal significance with the other four as colonizers in America. The Swedish colony founded in 1637 on the banks of the Delaware was regarded by the Dutch as an intrusion on their rights and fell victim to Dutch conquest in 1655. The Dutch enterprise on the Hudson and Delaware was in turn held by the English as equally an intrusion on English North America and the Dutch were dispossessed in 1664 by the same means as they had themselves employed upon the Swedes. During their development of New Netherlands the Dutch were not successful in planting the colony firmly on an agricultural basis, the fur trade proving attractively profitable. A system of colonial government in too close dependence upon a clumsily working confederate government at home and a system of local government which repressed individual initiative retarded the development of the colony. A few islands in the West Indies and a small stretch of the northeastern coast of the South American continent still remained — and do yet — as Dutch colonies in the New World.

Portugal began her American colonization in 1531 in Brazil, but was unable to give it the requisite attention until the 18th century. In the meantime the comparative freedom from restraint enjoyed by the colonizing population had exercised a developing effect, and, putting in practice lessons in regard to the exploitation of a tropical colony learned elsewhere, Portugal developed a colonial establishment stable enough to afford a refuge for the House of Braganza during the period of Napoleonic occupation of the Iberian peninsula. In 1821, the Brazilians with the concurrence of their regent, himself of the royal house of Portugal, proclaimed their independence from the Crown of Portugal, and this independence was subsequently ratified by treaty.

The Spaniards began colonizing with the second voyage of Columbus and the islands of the Caribbean, particularly Haiti and Cuba, became the scenes of an exploitation of the superficial riches of the tropics which served as bases for exploring conquests to the territory of the mainland. The policy of Spain toward her wide domain in the New World, as worked out in the 16th century, not in abstract theory, but in combination of theory with practice, was but little more illiberal, but considerably less intelligent than that of other states. But the climate of the part of the New World falling to them was not conducive to the steady, strenuous persistence necessary for the building up of permanent wealth-producing communities. Nor were the original characteristics of the colonizing population calculated to make success in such a career likely. The natives were not able to offer stubborn resistance to the rapidly moving enterprises of the conquistadores. A certain tendency to amalgamate with the natives — a tendency which weakened the stronger without strengthening the weaker race — did not prevent the evasion of the laws intended to protect the natives from the rapacity of their conquerors and to keep the two opponents of the official class in balance against each other. The too rapid early successes in the realm of military conquest and the easily won response to the search for the precious metals still further unfitted the Spaniard for what modern colonizing peoples are finding the most difficult of tasks — the intelligent exploitation of the possible economic resources of a tropical region where the available labor supply is for various reasons inefficient according to European standards. Nevertheless, though the Spanish dominance over such a great part of the New World could not guarantee prosperity to this empire, it was rather the shock given by the Napoleonic attack on the mother country and its consequences on Spanish internal warfare than the inherent strength of the separate divisions of Spanish-America, that accounts for the revolt of the greater part of this empire in the first three decades of the 19th century. And at the same time that political separation was taking place, Spain in Europe stood in such need of political help from England that a commercial invasion of Latin-American markets could not be prevented. With this once accomplished and the Napoleonic danger passed, the influence of England was publicly and privately used to obstruct all attempts from Spain to reunite the scattered fragments of the once mighty power in America. The sluggish development, to call it by no worse a name, which characterized what remained to Spain of dominion in America between the Latin-American revolts and the wresting of Cuba and Porto Rico by the intervention of the United States in 1898 illustrates the degree of effectiveness of Spanish colonial policy according to modern economic standards.

French colonization in America received much attention from the home government and the French temperatment was one adapted to success in dealing with the natives, and in amalgamation with them in preserving the elements of strength. But on the other hand the overzealous and intemperately exercised interference from home frequently nullified all the good that the lavish furnishing of assistance in materials and in military protection did to the fortunes of the colony. The climate was as excessive in its rigor as that of New Spain was in the opposite direction. The hostilty of the Iroquois, fiercest of all the native tribes, obstructed expansion to a more favorable clime and made extensive use of a vast forest domain for the fur-trade a more easy and attractive program than the jog-trot business of intensive agriculture and the development of permanent communities on the frontier for which latter task lack of the habits of initiative in self-government unfitted the colonizing population. The only colonizing material in the French people capable of developing such traits — the Huguenots — was peremptorily excluded from New France. So that when the English expansion had at length come into collision with the borders of the French forest preserve in the interior, New France on the continent was capable, by reason of the feudal and military force pervading its population, of effective resistance against the superior numbers of the English settlements co-operating but clumsily with each other. As between the French and British empires as world-units, however, there was soon no question of superiority, and France was definitively excluded from the con-

tinent as the result of the Seven Years' War (q.v.). The French possessions in the West Indies, acquired in various ways during the 17th century, remain to her, and make of her to that extent an American power.

The colonizing work of England in America belongs to the colonial period of United States history (q.v.). In broad outline, her policy toward her American domain was one which, whether with design or not, allowed wide scope for individual and local initiative. The English population afforded good colonizing material. The Indians gave no such serious trouble as did the Iroquois in the case of the French in the early stages of their colonizing. Defense against European attacks upon the colonies was effective. As builders of settlements in the New World, the English were eminently successful. In devising, or at any rate, applying a system of political connection between the home government and the colonies, the English reached an unfortunate place in their internal political development coincidently with a critical stage in the relations of colonies and mother country. The strain at that time and under those circumstances brought upon colonial loyalty proved too great and by the separation of the 13 Atlantic seaboard colonies, Great Britain's power in the New World was cut down to control of certain important West India islands and the area so recently wrested from France. Under the new spirit of the British Empire which appeared in the 19th century, these possessions have been so developed and bound in sentiment to the interests of the mother country that Great Britain stands second only to the United States as an American power.

Consult Winsor, 'Narrative and Critical History'; Fiske, 'Discovery of America'; Payne, 'Cambridge Modern History' (Vol. I); Morris, 'The History of Colonization); Roscher, 'The Spanish Colonial System.'

CHARLES WORTHEN SPENCER,
Assistant Professor of History, Princeton University.

AMERICA, American song, written in 1832 by Samuel Francis Smith, D.D.

My country! 'tis of thee,
Sweet land of liberty,
Of thee I sing.
Land where my fathers died!
Land of the Pilgrims' pride!
From every mountain side,
Let freedom ring!

My native country, thee —
Land of the noble free —
Thy name I love;
I love thy rocks and rills,
Thy woods and templed hills,
My heart with rapture thrills
Like that above.

Let music swell the breeze,
And ring from all the trees,
Sweet freedom's song;
Let mortal tongues awake;
Let all that breathe partake;
Let rocks their silence break —
The sound prolong.

Our father's God! to Thee,
Author of liberty,
To Thee we sing;
Long may our land be bright
With freedom's holy light;
Protect us by Thy might,
Great God, our King!

The circumstances connected with the writing of this famous hymn are best gathered from a letter written by the author, the Rev. Samuel Francis Smith, to Mr. J. H. Johnston of Brooklyn, who had asked concerning the occasion which induced the author to write it. The letter follows:

NEWTON CENTRE, MASS., *June* 5, 1887.
Mr. J. H. Johnston:

Dear Sir: The hymn "America" was not written with reference to any special occasion. A friend (Mr. Lowell Mason) put into my hands a quantity of music books in the German language early in the year 1832 — because, as he said, I could read them and he couldn't — with the request that I would translate any of the hymns and songs which struck my fancy, or, neglecting the German words, write hymus or songs of my own, adapted to the tunes, so that he could use the music. On a dismal day in February, turning over the leaves of one of these music books, I fell in with the tune, which pleased me — and, observing at a glance that the words were patriotic, without attempting to imitate them, or even to read them throughout, I was moved at once to write a song adapted to the music — and "America" is the result. I had no thought of writing a national hymn, and was surprised when it came to be widely used. I gave it to Mr. Mason soon after it was written, and have since learned that he greatly admired it. It was first used publicly at a Sabbath school celebration of independence in Park Street Church, Boston, on the 4th of July, 1832.

Respectfully yours,
S. F. SMITH.

See also NATIONAL HYMNS.

AMERICA, the name of the schooner yacht winning the international yacht race of 1851. The prize obtained, a silver tankard, has since been known as the "America's Cup." See YACHTS AND YACHTING.

AMERICA, Prehistoric. See ARCHÆOLOGY, AMERICAN.

AMERICA, South. See LATIN AMERICA; SOUTH AMERICA.

AMERICAN ACADEMY OF ARTS AND SCIENCES, an organization founded at Boston in 1780. John Adams, afterward President of the United States, was its chief promoter. Its purpose was to "cultivate every art and science which may tend to advance the interest, dignity, honor and happiness of a free, independent and virtuous people." It published for many years scientific memories as well as its proceedings. It has a scientific library of upward of 25,000 volumes.

AMERICAN ACADEMY OF MEDICINE, The. Organized in 1876 by a few physicians at Philadelphia. While at first the main qualification seems to have been a liberal education, the scope soon broadened to include an interest in the sociologic problems connected with medicine. The academy works through conferences at its annual meetings and occasional special conferences. Its publications are *The Journal of Sociologic Medicine* and reprints or groups of papers on some certain subject. It has about 600 members, most of whom are Fellows (physicians); there are also associate members (those not of the medical profession), and a few honorary members.

AMERICAN ACADEMY OF POLITICAL AND SOCIAL SCIENCE, The. The Academy was organized 14 Dec. 1889 to provide a national forum for the discussion of political and social questions. The Academy does not take sides upon controverted questions, but seeks to secure and present reliable information to assist the public in forming an intelligent and accurate opinion. It publishes annually six issues of 'The Annals,' each dealing with an important current social or political problem. These volumes contain serious discussions, not doctrinaire expressions of opinion. Five scientific sessions are held each year, during the winter months, and an annual meeting in April, extending over two days and including six sessions. The membership fee is $5 per year; life membership fee $100. Members not only receive the volumes of 'The Annals' but also have the privilege of attending all the sessions of the Academy, and the further privilege of applying to the editorial council for information upon current political and social questions.

AMERICAN ALLSPICE. See CALYCANTHUS.

AMERICAN ALOE. See AGAVE.

AMERICAN ANTHROPOLOGY. See ANTHROPOLOGY, AMERICAN.

AMERICAN ANTIQUARIAN SOCIETY, an association organized in 1812 at Worcester, Mass. The object of the society is the study and preservation of the antiquities of America, and the advancement of art and science throughout the world. Its library includes over 100,000 volumes, including a large number of the rarest Americana, very complete files of American newspapers and a rich collection of manuscripts. Its *Transactions* have been published since 1820 and the *Proceedings* semi-annually since 1849. It maintains an important museum of antiquities, gathered in all parts of North, South and Central America. A new library for the society was completed and occupied in 1910. The society maintains a fund aggregating over $100,000 for the support of various departments of its work.

AMERICAN ANTI-SLAVERY SOCIETY, The. See ANTI-SLAVERY SOCIETY, THE AMERICAN.

AMERICAN ART. The art history of America presents interesting conditions of receptivity as well as original productivity; indeed, artistic taste, it may be claimed, was primarily transplanted or transfused into the budding art of "The Fair New World." True to the traditions of historical repetition, the ideals of ancient Greece inspired an Italian renaissance; French, German and English art respectively, being viewed moreover at their best periods, give evidence of having been begotten through æsthetic assimilation and fruitful appreciation of the masterpieces of Angelo, Titian, Tintoretto, Rembrandt, Rubens, Veronese and Velasquez. The early American school not only emulates these treasured qualities of the old masters, as far as accessible in painting and sculpture of originals or in replicas, but experienced a healthful art evolution, normally stimulated by the contemporary works of Gainsborough, Reynolds, Lawrence and others at the close of the 18th century. It appears in accord with the artistic spirit of international reciprocity, that America provided the British Royal Academy with its second president in the personality of Benjamin West.

Although it would be intensely interesting to explore the field of Pan-American art, revealing Aztec and other aboriginal archæological relics, we are limited to the consideration of the subject coincidental with modern art and civilization. The works of Washington Allston, Gilbert, Stuart, West, Copley, Trumbull, Vanderlyn, Jarvis, Peele, Cole, Harding, and, at a later period, of Morse, Eliot, Mount and many others, afford invaluable examples of rare intrinsic value, with chronological evidences of the early development, impeded by all sorts of obstacles, of inborn genius and unmistakable tendencies of the progressive element even in the province of fine art.

American Classics.—A representative collection of the famous works by the American painters mentioned, had it been secured, would certainly to-day constitute a rare gallery of æsthetic "Americana" that well might be preserved for all time—"*con amore*"—"*pro patria et gloria*"; enkindling American art patriotism in line with that shown for the army and navy, agriculture and commercialism. It is too late, however, to secure the marvelous masterpiece by Allston, 'The Legend of the Bloody Hand,' it having unfortunately been destroyed by fire, and many other gems of renown are now lost sight of through lack of proper preservation and of popular appreciation. Vanderlyn's 'Ariadne,' however, has fared better in company with invaluable portraits painted by these gifted men and now in possession of the New York Historical Society. 'Marius Sitting Among the Ruins of Carthage,' a work that secured Vanderlyn, in reward for its merits, a first-class gold medal at the Paris Exposition, was a product of this period. The most important epochs of American history have been represented by native artistic talent. The sailing and landing of Columbus, the exploits of De Soto, the subjugation of savage life to that of civilization, colonial and Indian warfare, the declaration of national independence, revolutionary battles, Washington crossing the Delaware, and like famous subjects for painting and sculpture, that manifestly should be preserved by governmental direction. Although so long and disastrously belated, these facts and conditions logically suggest the formation of a national gallery of American art. The landscapes of Thomas Cole upheld, as did those of Turner, the traditions of Claude Lorraine; still in the spirit of a pioneer he proclaimed the grandeur of the primeval American forest in paintings direct from nature. His 'The Course of Empire,' now in possession of the New York Historical Society, a work that has never, we believe, been reproduced in any form, presents in four grand paintings the sway of civilization from savage life to an Arcadian period; then onward to the consummation of earthly power and magnificence; followed by the decadence occasioned by war of the elements, and that instigated by "man's inhumanity to man"; finally, the literal scene of monumental destruction and sublimely solemn desolation. Before dismissing attention called to this early period influenced, as stated, by foreign methods of technical expression,

native American genius found little public appreciation; still it faithfully progressed.

Science vs. Art.— Again about this time matter-of-fact utilitarianism appeared to dispel the ideal artist's poetic hopes, while every encouragement followed the success of practical scientific talent. Washington Irving essayed to be a painter, but concluded to devote his life to literature and the power of the pen. Robert Fulton, who began his career as a skillful landscape and portrait painter, attracting the friendship of Benjamin Franklin, who encouraged his studies abroad, and gave him letters to Benjamin West and others, returned to his native land to find that scientific conditions were required rather than a demand for the credentials of culture in works of fine art. The result was steamboat navigation. Another triumph for science may be recorded. Franklin himself had captured lightning from the skies; still it remained for the imagination and artistic skill of the professional painter, Samuel Finlay Breese Morse, the first president of the National Academy of Design, to subjugate the marvelous electric element that joins as neighbors all mankind.

"The Hudson-River School."— Nevertheless, the fine arts flourished; even modern travelers' tales of the wonderful scenery of two great continents stimulated artists and the lovers of art. "The Heart of the Andes," "Niagara," "The Arctic Region," "The Rocky Mountains," "The Catskills," "Lake Champlain," "Lake George" and the "Hudson River," all were delineated. Along with this demand for great subjects, often commensurate in quantity as to size of canvas with Ruskin's mathematical maxim, that the greatest work of art is the one presenting the greatest number of great ideas, there still prevailed in marked instances the glorious traditions of full-habited oil-painting to be found in the æsthetics of familiar environment of earth, air and water, as embodied in artistic values and soulful qualities — creations in harmony with Michel, Ruysael, Constable and the masters of Barbazon and Fontainebleau. Again, while scientific influences appear in the works of Durand, Church, Casalear and Kensett, they asserted a truly American artistic individuality; they copied directly from nature. They thought of no school nor technique, but carefully imitated what they saw. All these men with one exception had been practical engravers, laying down the burin and the needle-point to take up the pencil and the brush. Their respective biographical and æsthetical records in American art will be enduring; yet there comes the reflection that had their professional training been more liberal and adequate they would have attained to higher things. The importance of masterly academic training cannot be overestimated; as a means to an end, however great, education is the only acknowledged guide for the individual artist and for the community even in matters of taste. Nothing is more creditable to a civilized people than its credentials of culture. The formation of a fine art association in New York was at the beginning of the past century an occasion of vast importance to the commonwealth. The first action was taken in 1802 by a few prominent citizens, and six years later a charter was obtained with the name of The American Academy of Arts. The first officers under this charter were Robert Livingston, president; John Trumbull, vice-president; DeWitt Clinton, Dr. David Hosack, John R. Murray, William Cutting, and Charles Wilkes, directors. A school was equipped with casts brought from Paris by Mr. Livingston, and exhibitions of paintings and statuary were held for a time in an unused riding school in Greenwich Street near the Battery. Public interest in this movement was soon transferred to grand panorama schemes conducted by Vanderlyn at the "Rotunda," and by others with similar enterprises.

The National Academy of Design.— It was not until the year 1826 that the artists themselves, with Morse as president, founded the National Academy of Design in the earnest interests of American art, with educational purposes and exhibitional facilities; its influence increasing until the present day. Its membership consists of 100 academicians and an equal number of associate members, including the most distinguished painters and sculptors of America. Its list of fellowship for life likewise includes the most prominent public-spirited patrons of American art. Established for many years in the Academy building, tastefully modeled after the Palais Ducal of Venice and forming an attractive urban landmark, lack of accommodations for its growing schools and crowding commercial surroundings required a move to more suitable quarters. Unlike the Royal Academy of London, with its plethoric treasury, and similar institutions situated in other European art centres, the academy is without governmental endowment and may well enlist American art patriotism in the cause of æsthetic culture in fostering the fine arts of painting, sculpture and architecture. Other societies of American artists, water color societies and architectural leagues make annual exhibitions in New York; while art institutes throughout the United States in various cities attest the extent and importance of American art. We, as Americans, are an artistic people, cosmopolitan and composite, uniting the genius of all nations. The æsthetic field of general American artistic taste and industry has been strenuously productive. The ornamental, orderly and decorative work in clay, on china, glass, wood and stone as a tasteful and profitable divertissement, begins with the training of the kindergarten. Black and white illustration and etching has been awarded first-class medals at home and abroad. The beautiful and refined exemplified in aguarelle and oil-painting; in portraiture, genre and pastoral; in sculpture and architecture; and finally the grand and sublime of high art all confirm the achievements of American art and artists. In advancing these three divisions — the ornamental, the beautiful and the sublime — as a guide, we approach the philosophical consideration of the subject of fine arts.

Art and Science Differentiated.— What is, and what is not, fine art? Shakespeare's injunction "to hold, as it were, the mirror up to nature" is the best artistic advice ever given. Bacon in his essay is not so direct. He asks which is the greater trifler, one who would make a personage by geometrical proportions (perhaps by the fabled Greek cabala) or another who would select the best parts of divers faces to make one excellent (a veritable com-

posite picture)? He concludes at last that a painter may make a better face than ever was, but he must do it by a kind of felicity, as a musician who makes an excellent air in music, not by rule. If ever there was an artist, he was Shakespeare — if ever there lived a scientist, Lord Bacon was, perhaps, the most eminent, and in their respective views and definitions we find the differentiation between science and art. In any given work in so far as it may be mechanically constructed is presented a scientific product; and in so far as reproductive processes may exhaustively duplicate it, it falls short of the possibilities of fine art. An etching by a master may be an autographic art creation; but when it is possible through photography, photogravure or chromo-lithography to so perfectly duplicate a painting that the reproduction presents all the merits of the original it may be relegated to science rather than be accepted as genuine fine art. True consummate mechanism must ever go hand in hand with fine art; still a great work of art presents the maximum of art to the minimum of mechanism. A painting portraying living objects with a sharp contour, such as may delight the photographer, without the suggestive quality of stereoscopic relief, does not hold the mirror up to nature, and the work may be classed with scientific achievements even if accredited to the consummate mechanism of a Messonnier. Indeed reproductive processes have served a great purpose in defining the line of demarcation between science and are. Affectations have been swept away by a revelation of their superficiality; while the possibilities of inimitable fine oil-painting, a medium and technique that, of all ever employed, has the fewest possible limitations, have been enhanced as seen in the works of the American artists already mentioned; and in those of a growing group of American idealists, colorists and tonalists.

Pre-Raphaelitism.— Various have been the fashions or "isms" that have dominated American art at different periods of its history. Preraphaelitism as advocated by Ruskin was one of the earliest imported. Being appointed the legal executor of his hero-client, as well as being an enthusiastic admirer of his work, Ruskin claimed for Turner not only the grander qualities, but a command of detail that rivaled the ancients, although the artist, we are told, frankly declined the compliment. Turner was unquestionably the greatest modern master of decorative and scenic effect in pictorial combinations representing earth, air and water, being, indeed, entitled to the apotheosis of synthesis; still diligent search in the archives of the Royal Academy and National Gallery fails to reveal the qualities attributed to him by the author mentioned. Ruskin's enthusiasm proved contagious throughout the art circles of England and America; solicitous friends as well as the most influential art writers pleaded with the tyro to emulate not the work of Michelangelo, Titian or Raphael himself, but to follow in the footsteps of Perugino and Raphael's father or grandfather. This verily seemed like unto the dotage of imbecility in the light of Raphael's glorious art that had evolved the immaculate Sistine Madonna. He was brave, indeed, in the field of American art of that day, who could resist the popular and professional pressure of this pseudo-æsthetic movement. No vestige of it remains, and no wonder it was followed by impressionism — as a free and joyous transition from mechanical restrictions in art.

True Impressionism.— This was the artistic attempt to present the maximum of soulfulness conveyed to the world by finest art; employing the minimum of materiality and mechanism as seen in the rendition through mental vision of the fleeting sunset or twilight — such as may only be materialized on the morrow; the epitomization perhaps of a day's outing under the open skies or flying clouds, or in the sublime thunder-storm; in fact, the entire realm of imagination is unfolded by artistic impression. Such was the accepted province of genuine impressionism originally as associated with the artistic convictions and poetic spirit of Corot, Monet, Monticelli, William Hunt, William Page, George Fuller and many others. Impressionism naturally evolves symbolism and idealism, but in too many instances has deteriorated into affectation and mysticism. Premeditated and assumed mysticism is the *dernier-ressort* of mediocre painters and sculptors, as well as of the minor poets. It may not be mistaken for sublime spirituality. Dante, Shakespeare and Milton, treating even divine themes, never nebulized their ideas in mysticism; the same may be said of Bryant and Longfellow; while Poe, temperamentally, a mystic solitudinarian, in the field of poetic art presented the apotheosis of spirituality.

Ideal Naturalism.— The crowning glory in the art of any civilized country is that of naturalism. In the truest sense it utilizes even scientific "disjecta membra," as enumerated, and subjugates the same to the entirety of art — the comprehensive structural organic presentation of material nature, suggesting the qualities of size, form, weight, color and perspective values; chiaroscuro, and, above all, the ultimatum of expression and tone. These enduring qualities characterize the art of Inness, Martin, Wyant, Hunt and Page, and the growing group of American tonalists of the naturalistic school. A great advantage exists in American art from its cosmopolitan resources. In Paris one sees nothing but French art; in Munich, the German school; in London, English art, while the art institutions of America contain specimens of masterpieces from every source, notably the collection of the Metropolitan Museum of Art, and art institutes of Brooklyn, Boston, Chicago, Philadelphia and Pittsburgh, as well as collections in all our large cities. While every art centre of Christendom seems to be provided with an American colony of artists and students, expatriation is no longer a necessity in order to obtain an education in fine art.

Expert Supervision.— The Department of Commerce established by the general government is a step in the right direction of national affairs, and may make clear the way for the proposed Department of Art and Industries. It has been repeatedly advocated and constant evidences of its requirement as an absolute necessity have been presented to the government and to the people; still it is being detrimentally delayed. The appropriations for national and international expositions have repeatedly been used in a manner giving anything but satisfaction. Commissions and contracts for statuary, monuments and architecture that should receive the supervision of expert art judgment are left

to provisional committees of statesmen, who frankly admit their inability to judge in the affairs of fine art. The experiences resulting from the careless management of international expositions, certainly teach that no such enterprises should be thrust upon the community through flattering prospectuses, promises of profit, etc., until matured and definite plans and specifications shall have been officially inspected, approved or rejected by the projected national department of art and industries; this would also provide a valuable bureau of information in art affairs, enabling legislator and citizen to act or vote intelligently in regard to any appropriation, commission or tariff. The practical utility and public good to be derived from such a department may be demonstrated in many instances. A member of Congress having been appointed upon a committee assigned the duty of supervising the ground immediately surrounding the House of Representatives was astonished to find that millions of dollars had been expended upon the same; each new committee annually appointed having exercised its taste and judgment on the important matter. It was concluded that the advice of an expert landscape architect be secured, and this being done, the expenditure was practically ended. Again the enormous expense of indiscriminate illustration of congressional and department literature or printed matter has, to-day, caused anxiety and criticism. So in relation to all official cases requiring expert art supervision, eclectic sense and æsthetic taste should be at the service of the government. The plan involves no untried innovation; the French nation has it Minister des Beaux Arts, who is a member of the Cabinet of the republic of France, leading the world in art affairs, taste and fashion. The establishment of municipal art commissions is a step in the right direction. The task of correcting the contour of metropolitan architecture seems, indeed, herculean; individual buildings of great beauty are adjoined by the most heterogeneous structures; a three-story house appears between one of eight and a skyscraper of twenty. In no capital of Europe would such incongruities be permitted, and every possible facility should be afforded our municipal art commissions to correct this chaotic condition. Victor Hugo said "the beautiful is as useful as the useful, more so, perhaps." European municipal politics profit by the practical application of this fact; great cathedrals, public statuary and fountains, picture galleries and museums attract multitudes of tourists, thereby financially as well as æsthetically benefiting communities that keep in the vanguard of culture and civilization. See AMERICAN SCULPTURE, HISTORICAL SUBJECTS IN; ARCHITECTURE, AMERICAN; PAINTING, AMERICAN; SCULPTURE IN THE UNITED STATES. Consul Wright, Willard H., 'The New Movement in North America' (New York 1916).

CHARLES H. MILLER, N. A.

AMERICAN ASIATIC ASSOCIATION, an organization in the United States founded in 1898. Its purpose is to foster and safeguard the trade and commercial interests of the United States and others associated therewith in Japan, Korea, the Philippines and elsewhere in Asia and Oceania; and to disseminate information and cultivate interest in the life and politics of the East. It publishes a monthly magazine called *Asia*. Membership, 300. It has auxiliary societies at Shanghai, Yokohama and Kobe.

AMERICAN AS OFFICIAL DESIGNATION. In June 1904 an order was issued by Secretary of State Hay that on all new record-books, seals, etc., used by representatives of the United States in foreign countries there should appear the words "American Embassy," "American Legation," etc., in place of "Embassy of the United States," "Legation of the United States," etc., previously employed. The usage thus applied to all diplomatic establishments and consular officers had been followed by Secretary Hay when ambassador to England, his position being that all countries composed of "United States," for example, Mexico, Brazil, Colombia, etc., were described by the geographical, not the political, name of the country.

AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE, a society originally known as the Association of American Geologists, founded at Philadelphia in 1840. In 1842 it added Naturalists to its name and was known by this title until 1847, when the present organization was formed. During the past 50 years the names of practically all the leaders of American science have been on the register of the association, and the 52 volumes of its *Proceedings* contain many of the most important contributions to scientific literature published in this country. It is organized in 11 sections, each of which holds its own convention at the annual meeting of the association during the summer. The sections embrace the following departments of science: *A*, mathematics and astronomy; *B*, physics; *C*, chemistry; *D*, mechanical science and engineering; *E*, geology and geography; *F*, zoology; *G*, botany; *H*, anthropology and psychology; *I*, social and economic science; *K*, physiology and experimental medicine; and *L*, education. The association also serves as a centre for the meeting of a number of important special scientific societies which have become connected with it. It publishes annually a volume of *Proceedings*, and in 1901 became associated with the journal *Science*, making it the semi-official organ of the society. The association numbers over 10,000 members. Its roll of "Fellows" has included such well-known scientific men as Newcomb, Barker, Brush, Young, Lesley, Morse, Langley, Goodale, Prescott, A. Hall, Harkness, Gibbs, Gill, Putnam and Minot.

AMERICAN ASSOCIATION FOR LABOR LEGISLATION. This is a scientific society, organized in 1906 to serve as the American section of the international association of the same name, to promote uniformity of labor legislation in the United States, and to encourage the study of labor conditions with a view to promoting desirable laws. Prominent among the Association's achievements are the Federal law abolishing poisonous phosphorus in the match industry, and statutes in several States for the prevention of lead poisoning and compressed air illness, the reporting of occupational diseases and industrial accidents, and the establishment of one day's rest in seven. The organization has also been active in promoting public employment offices and adequate workmen's

compensation laws, and was instrumental in initiating the American movement for health insurance. *The American Labor Legislation Review* is the official publication.

AMERICAN ASTRONOMICAL SOCIETY, The. This society was founded in 1899 with an original membership of 113. The membership is onw about 300, and includes wellnigh all of the active astronomers of America, and many prominent foreign astronomers. The purpose of the society is to promote the advancement of astronomy in general and to further co-operation among members in the solution of the extensive problems of the science. The society holds annual meetings for conferences and for the presentation of current scientific work. It has issued two volumes of its publications, which are largely made up of proceedings of the various meetings.

AMERICAN BANKERS ASSOCIATIONS. See BANKS AND BANKING — BANKERS ASSOCIATIONS IN THE UNITED STATES (Article 22).

AMERICAN BAPTIST FOREIGN MISSION SOCIETY. Among the five young men whose sailing to foreign lands in 1812 constituted the founding of the foreign mission enterprise of American Christianity was Adoniram Judson. On the long voyage to India his study of the New Testament led to a change of conviction regarding baptism and accordingly he offered his services as a missionary to American Baptists. His challenge in 1814 called into existence "The General Missionary Convention of the Baptist Denomination in the United States of America for Foreign Missions." In 1846 the name of this organization was changed to "American Baptist Missionary Union," and in 1910 the present name of "American Baptist Foreign Mission Society" was adopted. Since 1826 the headquarters of the Society have been in Boston, Mass., and in 1905 the offices were removed to the new Ford building where they now occupy the entire eighth floor. The by-laws of the Society state that the purpose of the organization is to diffuse the knowledge of the religion of Jesus Christ by means of missions throughout the world. The passing of a hundred years brings on many changes. In the days of Judson the Baptists of America were of little influence, few in numbers and poor in financial resources. To-day they constitute a great denomination, a mighty power in the religious life of America. Their foreign missionary society has come to be one of the largest and most influential in the realm of Protestantism. A hundred years ago only $1,059 represented the financial expenditures for Baptist foreign missions, whereas during the past five years the receipts in support of this work have exceeded $1,000,000 annually. The work of the Society covers a vast expanse of territory in the non-Christian world. Ten mission fields are maintained — Japan, the Philippines, east China, west China, south China, Burma, Assam, Bengal-Orissa, south India and Belgian Kongo. In addition, by a co-operative arrangement, the Society since 1835 has been assisting the Baptist cause in Europe, and separate missions are maintained in eight European countries. The missionaries supported by the Society to-day number 688 (including those of the Woman's Society), and these are assisted by 6,673 native workers. In Europe 2,480 workers were in service in 1914, but what effect the war has had upon their number has not yet been determined. In the 10 missions of the non-Christian world there are 127 regularly maintained stations with missionaries in residence and 3,237 out-stations or preaching places. In non-Christian lands to-day 183,505 church members are enrolled in 1,732 regularly organized Baptist churches, of which 1,027, or 59 per cent, are self-supporting. It is a noteworthy fact, and one productive of deep gratification, that among the Karen people in Burma the percentage of self-supporting Baptist churches is greater than in any State of the Northern Baptist Convention. In 1916 the missionaries on all fields baptized 12,355 converts, and the total number of baptisms since the work first began has exceeded 625,000.

The service of the medical missionary is of value in that it visualizes the Great Physician, and at the same time opens the door to the evangelist with his healing gospel for the diseases of the soul. Fifty-one missionary physicians, assisted by 133 native nurses and other helpers, give their full time to this important work. Sixty-nine dispensaries constitute the equipment for their service. More than 83,000 patients received medical and surgical treatment during 1917, and plans are being made for a great advance in this phase of the Society's work. The educational work is conducted in six colleges, 35 theological seminaries and training schools, and 2,608 schools of all grades, with a total enrolment of over 85,000 pupils. More than 89,000 pupils receive religious instruction in 2,301 Sunday schools. The missionaries have translated the Bible, in whole or in part, into over 30 dialects and languages. Three printing and publication plants are connected with the Society, where bibles, periodicals, hymnbooks, textbooks and other literature are printed. The administration of this great enterprise is placed in the hands of a board of managers of 27 members, nine of whom are appointed each year at a Northern Baptist Convention. The plans and policies of the Board are carried out under the direction of the executive officers. At the present writing these are six in number. In the Foreign Department, which is charged with the responsibility for the work on the field, there are two foreign secretaries and an associate secretary.

In the Home Department for the presentation of the work to churches and the securing of funds there is a home secretary and an assistant secretary and treasurer.

WILLIAM B. LIPPHARD,
Assistant Secretary.

AMERICAN BAR ASSOCIATION, The. This association was formed on the initiative of the Connecticut State Bar Association, which appointed, in January 1878, a committee of three for that purpose. The committee prepared a call for a meeting of a selected list of lawyers from the different States on 21 Aug. 1878 to consider the expediency of such a step. This was signed by 14 of the leaders of the American bar. At that meeting there was an attendance of 72, coming from 20

States. A constitution was adopted, additional members elected, and a complete organization effected. The scheme thus adopted has been substantially followed ever since by the association, which meets annually, at different places, and publishes an annual volume reporting its doings, as well as a quarterly periodical called the *American Bar Association Journal*, one number of which is mainly devoted to comparative law and recent legislation in foreign countries. The Association has had a large influence throughout the country in advancing the standards of legal education, promoting sound legislation and securing uniformity in State statutes regulating matters of general concern, such as commercial paper, sales, warehousing, etc. To its efforts the creation of the United States Circuit Court of Appeals was largely due. The membership is now over 10,000, embracing every American State and Territory. Consult historical sketch by Jacob Weartt in the *New Jersey Law Journal* (1904, pp. 292, 336).

AMERICAN BIBLE SOCIETY, The, organized in New York in 1816, to encourage the wider circulation of the Bible. In 1841 an act of incorporation was obtained with privileges which have since been enlarged. In 1852 the Bible House was built, occupying the whole of the ground bounded by Third and Fourth avenues, Astor Place and Ninth Street. It is one of the oldest office buildings in New York. The government of the Society is entrusted to a board of managers, consisting of 36 laymen, one-fourth of whom retire from office each year, but are re-eligible. Laymen who were constituted directors for life before 1 June 1877, and ministers who are life members are authorized to attend the meetings of the board, with power to speak and vote. Its constant aim has been to secure the adequate translation of the Holy Scriptures into all the languages of the earth and to distribute these translations as widely as possible, and especially to reach the destitute of all classes and conditions. Four times it has undertaken to canvass the whole country for this purpose. These canvasses were begun in 1829, 1856, 1866 and in 1882. During the fourth resupply, beginning in 1882, more than 6,300,000 families were visited by its colporteurs, and 473,806 families were supplied with the Scriptures, and in addition nearly 300,000 individuals. In 1912 it issued Scriptures for use in the United States in 83 languages besides English. During the last 30 years its foreign circulation has steadily increased, rising from 250,000 copies in 1876 to over 2,000,000 copies in 1915. It has, by large grants both of money and books, aided missionary labors of the various Christian churches having missions in foreign lands to prosecute Bible translation and distribution. It has now 12 regular foreign agencies under its own direction, each under the supervision of an ordained minister of the gospel. During the last 30 years its foreign circulation has reached a total of 18,000,000 volumes. It has about 500 persons under its direction in the home field, and 810 in foreign lands. In addition to the printing done in the United States in 1915, it had Scriptures printed for its use at Shanghai, and other cities in China, at Yokohama, at Constantinople, at Beyrout and at Bangkok. Translations have been begun, and in part published, in several of the many languages spoken in the Philippine Islands. For the last year of record, which was its one hundredth year, ending 31 Dec. 1915, the society issued 7,204,497 volumes and for the 100 years 117,130,711 volumes. These Scriptures were in 164 languages, which include the languages of at least nine North American Indian tribes. The increase of Bible reading in China is most notable, the society's circulation reaching 2,225,000 volumes in the year 1915. Some large bequests have been made during the last decade, especially one from the late John S. Kennedy of $850,000. The endowment fund of the Society was added to by Mrs. Russell Sage, who gave $500,000, the society raising $500,000. The income of the society is however very inadequate to its great world needs. Its annual budget calls for an expenditure of over $800,000. The offices are at the Bible House (see BIBLE SOCIETY). Consult Dwight, 'The Centennial History of the Society' (New York 1916).

AMERICAN BOARD OF COMMISSIONERS FOR FOREIGN MISSIONS, The. This is the oldest foreign missionary society in America, having been organized in 1810. Its voting members are the members of the Congregational National Council with 150 additional, selected at large. The board has 650 Americans working in its 19 missions located in Japan, China, India, Turkey, Austria, Spain, Africa, Mexico, the Philippines and Micronesia. In addition the board supports 5,000 native workers, including teachers, preachers, nurses, doctors, Bible men and women selected from its converts in these various fields.

One-third of the work of the American board has been in European and Asiatic Turkey, this field having been assigned to the board as its exclusive territory. The work of the board consists in translation of the Bible and other books into the languages of foreign peoples, the establishment of churches, schools, colleges, hospitals and industrial plants in its various fields of work. Three of the most important colleges in Turkey to-day, Robert, Constantinople and Syrian Protestant, although now independent, are the product of American Board work.

The annual income of the board for the support of all this work is $1,100,000. This sum comes from the contributions of the churches, chiefly Congregational, from legacies and from the income of permanent funds. The churches which have been founded on the mission fields have been contributing a little more than $300,000 annually toward the enterprise.

The actual management of the business of the board is entrusted to the Prudential Committee centring in Boston, the board's headquarters, and consists of 12 men about evenly divided between laymen and ministers. This committee meets on Tuesday afternoon to consider the important business of the board which business, as a rule, has previously been carefully digested by its subcommittees. Much time of the Prudential Committee is taken up with considering applications for service in the foreign fields by young men and women from our American colleges. A conference is held the first of June each year for instruction of these new recruits. About 60 men and women are sent out to the fields each year. After seven years of service on the field these missionaries

are allowed to come home and spend a year on furlough at the expense of the board. The board issues monthly *The Missionary Herald,* an illustrated missionary magazine which is the oldest in America and probably the oldest in the world. Affiliated with the American Board are three women's boards with headquarters in Boston, Chicago and San Francisco. These boards of women support all the unmarried women missionaries, and raise about $300,000 annually for that purpose. Of the entire missionary force one-third are men and two-thirds are women.

AMERICAN BUREAU OF SHIPPING, a maritime association established in New York in 1867, for the purpose of collecting and disseminating information upon subjects of marine or commercial interest, of encouraging and advancing worthy and well-qualified commanders and other officers of vessels in the American merchant service, and of promoting the security of life and property on the seas.

AMERICAN CATHOLIC HISTORICAL SOCIETY, an organization founded in 1884 for the purpose of collecting and publishing research and information concerning the history and activities of the Catholic Church, and stimulating by lectures, etc., interest in Catholic affairs. It publishes 'Records' and supports a library and museum devoted to its purposes at Philadelphia. Membership, 612.

AMERICAN CHEMICAL SOCIETY, The. This society was founded in April 1876, its object being "the advancement of chemistry and the promotion of chemical research." The society publishes three journals: *Journal of the American Chemical Society,* founded in 1878; *Chemical Abstracts,* founded in 1907, and *Journal of Industrial and Engineering Chemistry,* founded in 1909. The membership of the society on 1 July 1916 was 8,100 and it is growing rapidly. The society is organized into eight divisions and 49 local sections, each having its own officers and governing bodies. The society meets semi-annually. The policy of organizing the members into divisions has been inaugurated, and eight enthusiastic divisions have been formed as follows: Division of Industrial Chemists and Chemical Engineers, Division of Physical and Inorganic Chemistry, Division of Fertilizer Chemistry, Division of Agricultural and Food Chemistry, Division of Organic Chemistry, Division of Pharmaceutical Chemistry, Division of Biological Chemistry and Division of Water, Sewage and Sanitation. The society affords especial facilities for chemists interested in a particular branch of the science to organize themselves into a representative body within its ranks. Forty-nine local sections, situated in various parts of the country, hold frequent meetings. The American Chemical Society is the largest chemical society in the world, having some 3,000 more members than its nearest rival—the Verein Deutscher Chemiker. Office of the secretary, Washington, D. C.

AMERICAN CITIES, Government of. See CITIES, AMERICAN, GOVERNMENT OF.

AMERICAN CIVIC ASSOCIATION, The, a voluntary organization formed 10 June 1904 by the consolidation of the American League for Civic Improvement and the American Park and Outdoor Art Association, its objects being "the cultivation of higher ideals of civic life and beauty in America, the promotion of city, town and neighborhood improvements, the preservation and development of landscape, and the advancement of outdoor art." The organization of a national association to act as an agency of inspiration to American towns and cities for improvement, and to serve as a clearing house of information in all such activities, was a natural development following the effective improvement activities that had for years been conducted by local effort, notably at Stockbridge and Newton Centre, Mass., and in other localities. The first efforts of such a local movement were generally of a home and neighborhood character. Unattractive and dirty backyards were transformed into little bowers of beauty and cleanliness. From these initial steps there had developed, largely through the nation-wide propaganda of the association, the larger movements that apply to communities at large, such as the creation and maintenance of city park areas, boulevards, playgrounds for children and recreational areas for adults. Involved in these general improvements have been specialized efforts for the beautifying of water-fronts, for the elimination of unnecessary smoke and unsightly billboards. The culmination of all these activities has developed within the past 10 years in a systematic propaganda by the association for the adoption of comprehensive city plans, enlisting the advice and counsel of professional landscape architects and opening the way for an orderly and systematic development of cities and towns. During 1916, as an extension of the idea embraced in city planning, there has been developed a movement in the association for country planning, which proposes to direct a similar effort for the beautification and improvement of the rural districts. In extension of its general purposes for the preservation and development of landscape the association has been the leader in two great movements for the preservation of scenery, namely, in behalf of the Falls of Niagara—to prevent their spoliation by commercial interests—and second, for the extension of the American National Park system. The association originated a proposal to have created by Congress a National Park Service, which in 1916 appeared likely of realization. The park service as contemplated will be in the Department of the Interior and have jurisdiction over the 14 existing national parks and the 31 national monuments heretofore in the Department of the Interior and the Department of Agriculture. Since the consolidation effected in Saint Louis, the American Civic Association has held 10 annual conventions. Its membership consists of life members, sustaining members, annual members, councilor members and affiliated members. The work of the association is conducted from its general offices through committee and department heads as follows: City Planning, National Parks, State and County Parks, Country Planning, the Billboard Nuisance, the Smoke Nuisance, the Noise Nuisance, Schools as Community Centres, and the Press. Active propaganda is carried on by means of department leaflets, clipping sheets and correspondence. The principal offices of the association are at Washington, D. C.

AMERICAN CLIMATOLOGICAL ASSOCIATION, a medical organization founded in New York city in 1884 "for the study of Climatology, Hydrology, and Diseases of the Circulatory and Respiratory Organs." Candidates for membership must have contributed something to the literature of the subjects before election, this insuring a select membership, which the roll shows to be very generally distributed among the medical profession throughout the United States, with distinguished honorary and corresponding members in England, Canada, Mexico, South America, South Africa and Australia and other parts of the world. Annual meetings have been held since the foundation, at which papers confined strictly to the objects mentioned in the constitution of the organization are read and discussed and afterward published in the *Transactions* of the association; 20 volumes have already appeared, and copies are sent annually to the principal libraries throughout the world. The title of some recent contributions showing the value and wide scope of this association are: 'The Advantages of Southern California in the Treatment of Tuberculosis'; 'The Climate and Waters of Hot Springs, Va.'; 'Something of the Geography of Croupous Pneumonia'; 'Recent American Contributions to the Methods of Prevention and Treatment of Pulmonary Tuberculosis'; 'Climatology as a Study in the Medical Schools'; 'The Climate of Santa Barbara, California'; 'The Climatology of Muskoka, Ontario, Canada'; 'The Climates and Diseases of Central America and Panama.' The head offices are in Philadelphia; the organization must not be confounded with a similar important and cofriendly society, "The National Association for the Study and Prevention of Tuberculosis," with headquarters in New York city. The membership in 1916 was 136.

AMERICAN COLLEGE, The. Its Place and Importance.— The American college has no exact counterpart in the educational system of any other country, although its elements are derived from European systems, and in particular from Great Britain. And while it is true that the primary form of organization in our earliest colleges, such as Harvard, Yale and Princeton, was inherited from the English University of Cambridge, still it was subjected to modification at the very beginning, to adapt the college to its community, and afterward it was progressively modified to assure close sympathy with the character of the growing American nation. The result is an institution with derived elements of composition and in less degree of form, which has developed for itself an organization notably different from the old-world schools.

So the college, from the nature of its development, holds the central place in the historic growth of American higher education. It remains to-day the one repository and shelter of liberal education as distinguished from technical or commercial training, the only available foundation for the erection of universities containing faculties devoted to the maintenance of pure learning, and the only institution which can furnish the preparation which is always desired, even though it is not yet generally exacted, by professional schools. Singularly enough, the relation of directive influence sustained to-day by our colleges to the university problem is not unlike the relation held in the Middle Ages by the inferior faculty of arts at the University of Paris to the affairs of the university as a whole. In both cases the college, or faculty of arts, appears as the preliminary instructor in the essentials of liberal education; this earlier education is recognized as the proper requisite for later study in the professional faculties; and in both cases the inferior faculty contains the germ of the higher university faculty of pure learning, the faculty of arts, sciences and philosophy. The reason for this similarity is that the American college in this respect perpetuates and develops a fundamental tradition of liberal learning, which found its way from Paris through Oxford to Cambridge and then from Cambridge to our shores. The parallel of our college history with the Old-World history holds good in other important respects. Still, in order to understand the precise nature and unique influence of the college in American education, it is not necessary to trace the story of its development, for in its various forms of present organization it reveals the normal type which has been evolved, survivals of past stages of development, instances of variation and even of degeneration from the type, and interesting present experiments which foreshadow the future.

The Old-fashioned College.— The three commonly accepted divisions of education into primary, secondary and higher stages, while fully recognized in America, are not followed rigorously in organization. Primary education is more clearly separable from secondary than secondary from the higher or university stage. The chief cause for this partial blending of the secondary and higher stages is the college. However illogical and indefensible such a mixture may appear, the historical outworking of this partial blending has been compelled by the exigencies of our history and has been fruitful in good results.

The American college, then, as contrasted with European schools, is a composite thing — partly secondary and partly higher in its organization. It consists regularly of a four-year course of study leading to the bachelor's degree. Up to the close of the Civil War (1861–65) it was mainly an institution of secondary education, with some anticipations of university studies toward the end of the course, which, however, were usually taught as rounding out the course of disciplinary education, rather than as subjects of free investigation. The average age of graduation was about 20. The maximum course of preparation in secondary schools was four years. In the better schools they studied Latin and Greek grammar, four books of Cæsar, six books of Virgil's Æneid, six orations of Cicero, three books of Xenophon's Anabasis and two of Homer's Iliad, together with arithmetic, plane geometry (not always complete) and algebra to, or at most through, quadratic equations, This the stronger colleges required for entrance; but many weaker ones were compelled to teach some of these preparatory studies in the first two years of the college course. With few and unimportant exceptions the four-year course consisted of prescribed studies, including English literature and rhetoric, Latin, Greek, mathematics, natural philosophy, chemistry, the ele-

ments of deductive logic, moral philosophy and political economy, and often a little psychology and metaphysics. Perhaps some ancient or general history was added. French and German were sometimes scantily taught. At graduation the student received the degree of bachelor of arts, and then entered some professional school, or went into business or into teaching in the primary or secondary schools.

The College of To-day.—At the present time things are very different. The old four-year course, consisting entirely of a single set of prescribed studies leading to the one degree of bachelor of arts, has grown and branched in many ways. The better preparation now given in thousands of schools has enabled colleges to ask for somewhat higher entrance requirements and to exact them. The age of entrance has increased. In some quarters the increasing age of the students has raised the question of shortening the course to three years or allowing the last year to be occupied with professional studies in order that young men may not be kept back too long from entering upon their professional studies. A generation ago a young man graduated at 20 without difficulty and after two or three years in studying law or medicine he began to earn his living at 22 or 23. But to-day a college student is 22 years old at graduation and if he studies law or medicine he must wait until he is 25 or 26 to begin earning his living. Accordingly boys are now passing in considerable numbers directly from secondary schools, which do not really complete their secondary education, to the professional schools. The problem is an economic one, and it is affecting college courses of study. One solution, to shorten the course to three years, was advanced by President Eliot of Harvard. But this proposal has not met with general favor. Another proposal is to keep the four-year course and allow professional studies in the last year, thus enabling the student to save one year in the professional school. This experiment is being tried at Columbia and elsewhere. A third proposal is to keep the college course free from professional studies, but to give opportunities in the last year or the last two years to pursue liberal courses clearly underlying professional training, thus saving a year of professional study. This is the trend of recent experiments in Yale and Princeton. The one common consideration in favor of all these proposals is that a year is saved. Against the three-year course, it is argued that there is no need to abolish the four-year course in order to save a year. Against the admission of strictly professional studies it is argued that work done in a professional school ought not to count toward two degrees representing two radically different things. Against the proposal to allow the liberal studies which most closely underlie the professions, it is argued that this is a half-way measure, after all.

Alterations in the Course.— The four-year course, however, no longer leads solely to the degree of bachelor of arts, and this old degree has itself been modified. With the founding of schools of science, aiming to give a modern form of liberal education based mainly on the physical and natural sciences, the degree of bachelor of science came into use. Then intermediate courses were constituted, resting on Latin, the modern languages, history, philosophy, mathematics and science, and thus the degree of bachelor of letters or bachelor of philosophy came into use. Sometimes the various courses in engineering were made four-year undergraduate course with their degrees virtually rated as bachelor's degrees. Still other degrees of lesser importance came into vogue here and there to mark the completion of a four-year college course. The dispersing pressure of the newer studies and the practical demands of American life proved too strong to be held in form or to be kept out by the barriers of the old course of purely liberal studies with its single and definite degree, and new degrees were added to represent the attempted organization of newer tendencies. Compared with the old course such courses lack definiteness of structure. They aimed to realize new and imperfectly understood conceptions of education, and were composed of studies whose inner content was changing rapidly, or else were "half-and-half" forms of education, difficult to arrange in a system that promised stability, as in the case of studies leading to the bachelor of letters or bachelor of philosophy. A graver source of trouble was the admission of various engineering and other technical studies as parallel undergraduate courses. This tended to confuse in the minds of students the radical distinction between liberal and utilitarian ideals in education, and by the attractiveness of the "bread-and-butter" courses, to diminish the strength of the liberal studies. When in addition it is remembered that the newer courses, whether liberal, semi-liberal or technical, exacted less from preparatory schools in actual quantity of school work necessary for entrance into college, it will be seen that the level of preparation for college was really lowered.

The present drift of opinion in colleges which offer more than one bachelor's degree is more reassuring than it was some 20 years ago. There is a noticeable and growing tendency to draw a sharper line between liberal and technical education and to retain undergraduate college education in liberal studies as the best foundation for technical studies, thus elevating the latter to a professional dignity comparable with law, medicine, and divinity. The more this conception prevails the more will college courses in engineering be converted into graduate, or at least partially graduate, courses. Independent schools of technology may continue to offer their courses to young students of college age, but where such schools have been associated as parts of colleges or universities the tendency to a clearer separation of technical from liberal studies seems likely to prevail.

Another hopeful tendency gradually gathering strength is to give the various bachelor's degrees more definite significance by making them stand for distinct types of liberal or semi-liberal education. First comes the academic course, attempting a general liberal education, consisting of classical and modern literatures, mathematics and science, with historical, political and philosophical studies, and leading to the bachelor of arts degree. The second aims to represent a strictly modern cul-

ture predominantly scientific in character, and culminating in the degree of bachelor of science. In this course the technical aspects of the sciences taught tended to create a demand for strictly technological instruction. So schools of science do little save produce experts in the various mechanical and chemical arts and industries. Conscious of this difficulty, many schools of science have been giving larger place in the curriculum to some of the more available humanistic studies, especially French, German and English. Economics, modern history and even the elements of philosophy have found place. Some improvement has also been effected by increasing the entrance requirements in quantity of school work. But the course still suffers from an inner antagonism between technical and liberal impulses, and until it settles into a strictly technical form, or else comes to represent a strictly modern liberal culture, its stability cannot be regarded as assured. In the independent scientific schools, unassociated with colleges, it seems probable the course will keep or assume a highly technical form. But wherever it exists side by side with other bachelor's courses as a proposed representative of some form of liberal education, it will almost inevitably tend toward the ideal of a modern culture mainly scientific. The process, however, promises to be slow and difficult. There is not only a financial risk, but a serious theoretical difficulty in realizing this form of liberal education. The antagonism between the technical and liberal impulses in the course seems very difficult to eliminate completely. The utilitarian instinct of the time militates against devotion to the intellectual value of modern studies and tends more and more toward technical standards.

The third type of liberal college education is the intermediate course labeled with the degree of bachelor of letters or bachelor of philosophy. It differs from the other courses mainly in its treatment of the classical languages. To placate the practical spirit it drops Greek, but retains Latin both as an aid to general culture and as a help in learning the modern languages. Although indeterminate and intermediate, it serves a valuable end by providing many students, who do not care for the classical languages in their entirety, with a sufficiently liberal form of education to be of great service. Judged from the standpoint of the historical bachelor of arts course, it is a less general but still valuable culture. Judged from the standpoint of the bachelor of science course, it appears to escape the unhappy conflict between the technical and liberal impulses.

Some colleges, following the example of Harvard under President Eliot, dealt with the bachelor degree very differently. The meaning of the degree was radically altered, so as to represent the free selections made by the students themselves out of the range of liberal studies. In such a plan it no longer stands for the completion of a definite curriculum composed of a few clearly related central studies constituting a positive type. What it does stand for is not easy to define, because of the variation of practice in different colleges and the wide diversity of selection on the part of the student. In the undergraduate college connected with the Johns Hopkins University at Baltimore choice is regulated by prescribing moderately elastic groups of cognate studies, the student being required to say which group he will choose. In Harvard College the student has been allowed to choose what he prefers, subject to such limitations as the priority of elementary to advanced courses in any subject, and the coincidence in time of various courses. But the so-called "free-elective system" inaugurated by President Eliot has been definitely abandoned by Harvard and a system requiring concentration in one leading division of studies, with some work in each of the three other leading divisions, has been introduced.

Other Phases of Change.— To what extent the undergraduate collegian has become a university student is the real question around which a controversy of vital importance is raging.

The profound change indicated by external symptoms has been in progress since the Civil War, and is still working along toward its consummation. The difficult thing in analyzing this change is not merely to understand the change from a uniform to a multiform mode of life and organization, but to understand that what is changing is the old-fashioned American college. But even the old-fashioned colleges, while aiming to follow out a single course of study ending in a single degree of single meaning, did not succeed in exhibiting such close individual resemblance to each other as is to be found among the lycées of France, the public schools of England or the gymnasia of Germany. Many colleges really served as preparatory schools for larger and stronger colleges, and many so-called universities did not attain and in fact do not yet attain to the real though less pretentious dignity of the better colleges. For the sake of simplicity then we discard from our consideration all except the better colleges which, when taken together, exhibit the dominant tendency.

How, then, have these better colleges changed? Speaking generally, they have changed in a way which reflects the diversified progress of the country, and yet they have had an important influence in leading and organizing the national progress. Then, too, the change is not merely a change of form, but of spirit. In the older days scarcely any college had as many as 400 or 500 students, and the range of studies was limited. The faculty of the college exercised a strong paternal enxiety and oversight on behalf of the morals and religion as well as over the studies of the students. The authority of the president was almost patriarchal in character. Not highly developed insight into the problems of education but plain common sense in governing students was the condition of a successful presidency. The range of studies has increased. With the strengthening of preparatory courses, the school preparation of students has improved, and at the same time their average age at entrance has risen. The number of professors has multiplied. The old-fashioned college professor, the man of moderate general scholarship and of austere yet kindly interest in the personal welfare of those he taught, still remains; but at his side has appeared the newer type of American college professor, the man of high special learning in some one subject or branch, who considers it his primary duty to investigate, his next duty to teach and his least duty to

exercise a personal care for the individual students. Perhaps the old type will be replaced by the new. Such a result, however, would not be an unmixed gain, and our finest college professors to-day endeavor to combine high special attainments as scholars with deep interest in the personal well-being of their students. The authority of the faculty is still sufficient, but is exercised differently. Student self-government is the order of the day, and the more this prevails the less is exercise of faculty authority found to be necessary. The presidents of our larger colleges, and even of many of the smaller, are becoming more and more administrative officers and less and less teachers. It is no doubt something of a loss that the students should not have the intimate personal acquaintance with the president enjoyed by students a generation ago, but mere numbers frequently make this impossible. Out-of-door sports have also entered to modify and improve the spirit of our academic life. They have developed their own evils, but at the same time have done wonders for the physical health of the students, the diminution of student disorders and the fostering of an intense *esprit de corps*. In the reaction from the asceticism of early college life there is little doubt athletics have gone too far. But the abuses of college athletics can be corrected, and are to some extent self-correcting.

Nearly all our colleges are avowedly or impliedly Christian. A respectable minority of them are Roman Catholic. The large majority are under Protestant influences, which are seldom denominational. The student is expected to attend certain religious exercises, such as morning prayers; but often all such attendance is voluntary. The religious life of the undergraduates finds its expression in various societies, which endeavor to promote the Christian fellowship and life of their members. While moral and religious convictions are freer and sometimes laxer than of old, the Christian life in our colleges is real and pervasive.

As a rule the student is so absorbed by the scholastic, athletic and miscellaneous activities of his college that he sees little outside social life. This is particularly true in colleges which enjoy academic seclusion amid rural surroundings, for here more than anywhere else is to be seen the natural unperturbed outworking of the undergraduate spirit.

Development of Elective Courses.— The non-scholastic aspects of our present college life are important in that they give tone to the whole picture, but they do not account for the great transformation which has been wrought for that transformation is distinctly scholastic. It is caused by the increase of students, their better preparation and their greater age. The studies which made up the curriculum leading to the old bachelor of arts degree are now being completed before the end, sometimes by the middle of the college course. There is to-day no reason why a young man of 20 should not know as much as his father knew at 20. But at 20 his father had graduated with the bachelor of arts degree, whereas at 20 the son is only half way through his college course. As this fact forced itself upon the older and stronger colleges, experiments were made in granting a limited amount of elective freedom to students in the latter part of their course; first in the senior year and then in the junior year, until in some instances the whole four-year course became elective. In some colleges a student may obtain the bachelor of arts degree without studying any science, or he may omit his classics, or he may know nothing of philosophy. To-day the problem of the relation of prescribed to elective studies is a question of constant interest and perpetual readjustment. The solutions offered are many.

The first proposal, which has now scarcely an advocate, is plainly an impossible one. It is to insist on the old-fashioned four-year prescribed course. But the old-fashioned course cannot be restored, because it no longer suits our age. Young men will not go to college and remain there until the age of 22 years without some opportunity to exercise freedom of choice in their studies.

The second proposal is to constitute the undergraduate course entirely, or almost entirely, of elective studies. It is argued that when a young man is 18 years of age, he is old enough to choose his liberal studies, and that his own choice will be better for him individually than any prescription the wisest college faculty may make. The advocates of this view admit its dangers. They see the perils of incoherency and discontinuity in the choice of studies. They see that many students are influenced, not by the intrinsic value of the studies, but by their liking for this or that instructor, or the companionship of certain students, or for the easiness of certain crowded courses. Yet they argue that the college student must be free at some time, that his sense of responsibility will be developed the sooner he is compelled to choose for himself, and that he will have the stimulating and sobering consciousness that what he does is his own act and not the prescription of others for him. Those who oppose this view argue that the academic freedom here proposed belongs to university rather than to college students; that the American freshman is not a university student in the sense in which that term has been commonly understood in the educated world, because of his much shorter preparatory training, and his mental immaturity as compared with the English and Continental student. If, therefore, he is to be as well educated as they are, some of his time in college, the first two years should be spent in rounding out and enlarging his properly secondary education before entering upon that elective freedom which has a place, and a large place, in our present undergraduate courses.

A third proposal is a conservative modification of the one just mentioned. It is to prescribe groups of cognate studies with the object of concentrating attention on related subjects in that field which the student may prefer. The advantage claimed for this mode is that it allows the student to choose the field of study he likes, and then safeguards him against incoherency by requiring him to pursue a group of well-related courses in that field. The advocates of wider freedom object to this as fettering spontaneity of choice, as not recognizing the fact that there are many students for whom it is advantageous to choose a study here and there at will, as a piece of side work outside the chosen field of their activity. The objection to this plan of restricted groups and

also to the plan of practically unrestricted freedom is that it offers temptations to premature specialization at the expense of broad intellectual training.

Still another proposal remains to be considered. Its followers urge that the best type of liberal education is to be found in the historic academic course, which has been the centre and strength of American college life. They concede that other bachelor's courses may give a valuable education to many, provided these courses are consistently organized. They hold that it is possible to ascertain with sufficient exactness just what studies ought to be prescribed as integral parts of these courses, and that the preliminary training given in these prescribed studies develops maturity in the young sudent and enables him to choose intelligently his later elective studies. At the present time, in their view, it is not wise to introduce elective studies until about the middle of the college course. These studies should be organized and related in a system, and connected with the underlying system of prescribed studies. The principle of freedom should be introduced gradually, not suddenly, and should lead to complete freedom as soon as it is clear the student is able to use it well. A form of this view which finds a good deal of support is that elective studies should be introduced first of all in the form of extensions of subjects already studied by the student, in order that he may make his first experiment of choice in an area where he is most familiar. According to this view the second stage of elective studies should be the introduction of large general courses in leading subjects, accompanied by special courses for students of exceptional ability in special directions, and finally leading to as high a degree of specialization as the resources of the college will allow.

Modes of Instruction.— Instruction is still mainly conducted by recitation and lecture, the recitation finding its chief place in the earlier and the lecture in the later part of the course. For purposes of recitation the classes are divided into sections of 25 or 30 students, and the exercise is usually based on a definitely allotted portion of some standard textbook. Much has been done to improve the character of this exercise. The correction of mistakes, the attempt to lead the student to discover the cause of his mistakes, and the endeavor to teach the entire class through the performance of each individual, are the aim of the more skillful instructors. The professors most skilled in the art of conducting recitations, rather than those who depend wholly on lectures, leave the most abiding impression. While instruction by recitation continues with effectiveness in the latter part of the course, especially with smaller groups of students, yet instruction by lecture is the rule. The lecturer may have to face a class which enrolls as many students as the whole college contained a generation ago. He delivers his lecture, while those before him take notes, or as they listen read a printed syllabus prepared for the use of the class, and add such jottings as may seem desirable. In many lecture courses the recitation is employed as an effective auxiliary. The «perceptorial» mode of counsel and supervision, in vogue at Princeton since 1905, has been valuable in meeting the difficulties of individual students, taken in small groups. Other forms of instruction find place. In all except elementary courses in science the laboratory plays a most important part, and even in lectures in introductory courses in physics, chemistry or biology full experimental illustration is the rule. The library serves as a sort of laboratory for the humanistic studies. Students are encouraged to learn the use of the college library as auxiliary to the regular exercises of the curriculum. Certain books are appointed as collateral reading, and the written examination at the end of the term often takes account of this outside reading. That prolonged reading, which gives such wide and assuring acquaintance with the important literature of any subject, is as yet unattempted in a really adequate degree.

The academic year is divided into two (sometimes three) terms. At the end of each term the student is required to pass a fairly rigorous set of written examinations. Oral examinations have largely disappeared. Very rarely a high record of attainment in recitations during the term entitles a student to exemption from examination. In awarding honors the old academic college confined itself almost entirely to general honors. Honors for general eminence still remains in most colleges. The rank list of the class at graduation either arranges the students in ordinal position (in which case the first honor-man still appears) or else divides the class into a series of groups arranged in order of general scholarly merit. In such cases the old first honor-man is one of the select a few who constitute the highest group in the class. But special honors in particular studies, while not unknown in the past, are really a development of our time. Undoubtedly they have tended to increase the interest of abler students in their favorite studies. A student trying for special honors is, of course, specializing in some sense, though he is not ordinarily pursuing original research. He is rather enlarging and deepening his acquaintance with some one important subject, such as history or mathematics.

Student Life.— At 18 the typical student of the older eastern college has completed a four-year course in some secondary school. He finds near at hand either the college entrance board's examination or a local entrance examination conducted by a representative of this intended college. The days and exact hours of examination and the examination papers are the same as for the examination held at the college. His answers are sent on to be marked and estimated. In a week or two he receives notice of his admission to the freshman class.

Having passed his entrance examinations, he is now entitled to secure rooms in one of the dormitories, or else to find quarters outside the college campus in town. In the following autumn his name is enrolled in the matriculation book and his student career begins. His newness and strangeness naturally pick him out for notice on the part of the older students, especially those of the sophomore class. But these annoyances soon cease unless he be vain or «very fresh.» The daily round of college exercises demands his attention, and in the classroom he begins to pass through a process of attrition more beneficent in its spirit. Under the steady measuring gaze of the instructor, and the unuttered but very real judgment of

his classmates who sit about him, he begins to measure himself and to be measured by college standards. He is learning something not down in the books, and what he is thus discovering is well pictured in the words of Professor Hibben: "There is a fair field to all and no favor. Wealth does not make for a man nor the lack of it against him. The students live their lives upon one social level. There is a deep-seated intolerance of all snobbishness and pretension. The dictum of the 'varsity field, 'No grandstand playing!' obtains in all quarters of the undergraduate life. It signifies no cant in religion; no pedantry in scholarship; no affectation in manners; no pretense in friendship. This is the first and enduring lesson which the freshman must learn. He learns and he forgets many other lessons, but this must be held in lively remembrance until it has become a second nature." His college comradeship continues and constitutes his social world.

In addition to this ever-present gregarious comradeship which environs and inspires him, our entering freshman finds the deeper intimacies of close individual friendship. As a matter of course he has some one most intimate friend, generally his room-mate or "chum." Side by side they mingle with their fellows. They stand together and, it may be, they fall together, and then rise together. And thus the class is paired off, and yet not to the lessening of the deep class fellowship. Here indeed is a form of communism, temporary and local, but most intense. They freely use things in common, not excepting the property of the college. They are welcome to enter each other's rooms at pleasure and use their friends' tobacco and stationery, or to borrow such articles of furniture and bric-a-brac as will brighten their own rooms for some special occasion. Money, however, stands on a different basis from other valuables. It is freely loaned for an indefinite time, but is strictly repaid. A student who lends his fellow money at interest cannot live in a college community.

Our student, unless he is an unusual recluse, takes some part in athletics. If he is not able to win a place on the football team or baseball nine or crew, which represents his alma mater in intercollegiate contests, he is very likely to be found playing ball in some organization improvised for the day, or trying his hand at tennis or golf.

He has still other interests outside the curriculum. He may be a member of the voluntary religious society of the students. Perhaps he gets a place on the glee club or dramatic club. He may become one of the editors of the daily college paper or of the monthly literary magazine. Perhaps he is manager or assistant business manager for one or another undergraduate organization. Then there are the whist clubs and time-consuming chess clubs. There are also circles for outside reading and discussion springing up around the course of study, as well as the societies which train in speaking and debating. Perhaps he may win the distinction of representing his college in an intercollegiate debate, and success in intercollegiate debating is highly coveted. The contestants are greatly honored, for debating and athletics form the principal bond of union between the different colleges and give to their participants intercollegiate distinction.

Until the student passes out of freshman year, he is not always free to choose what kind of clothes he will wear. In some colleges freshmen are not allowed to wear the colors, except on rare occasions. But as soon as he becomes a sophomore he is free to do as he likes. Then he and his classmates suddenly appear wearing various hats, picturesque and often grotesque in appearance, and revel particularly in golfing suits. Toward the close of the course their daily dress becomes more conventional, though the universal interest in athletics continues to affect the student mode to the end. He has other amusements besides athletics, and these again are found in the student circle. His briarwood pipe goes with him almost everywhere. In the evening, when the work of the scholastic day is done, he sits with his comrades at an unconventional "smoker," or else they may gather round the table of some college restaurant. At such evening sessions the different phases of student politics are discussed again and again. College songs are sung, the air being carried in that sonorous baritone which is the dominant sound in all our student music. Tales and jests fill out the hour. At the end the college cheer is given as the men start strolling homeward, singing as they go. Arrived on the campus they disperse, and their good-night calls echo from the doors and windows of the different dormitories. And so the day ends where it began; within that closed circle where every student lives in "shouting distance" of the others.

Our former freshman is getting on bravely toward the end of his course. The closing months of senior year pass swiftly. His class procession is preparing to march out into the world, and there take its place as a higher order of freshmen in the long file of the classes of alumni advancing with their thinning ranks toward middle manhood and beyond,— and when commencement is over his undergraduate life is ended.

What has he acquired in the four years? At least some insight into the terms and commonplaces of liberal learning and some discipline in the central categories of knowledge, some moral training acquired in the punctual performance of perhaps unwelcome daily duty and some reverence for things intellectual and spiritual. He is not only a very different man from what he was when he entered, but very different from what he could have become had he not entered. He is wiser socially. He is becoming cosmopolitan. Awkwardness, personal eccentricity, conceit, diffidence and all that is callow or forward or perverse have been taken from him, so far as the ceaseless attrition of his fellow-students and professors has touched him. He has been unconsciously developed into the genuine collegian. He is still frank and unconventional. But he has become more tolerant, better balanced, more cultivated and more open-minded, and thus better able to direct himself and others. It is little wonder his student affiliations last. As he goes out to take his place among the thousands of his fellow alumni it is natural that his and their filial devotion to their academic mother should last through life. No matter what university he may subsequently attend, here or abroad, his college allegiance remains unshaken. It is this

which explains the active interest shown by our alumni. In the best sense they advertise their college to the public, and it is to their exertions the recent rapid advancement of many of our colleges is largely due.

Organization and Administration.— The form of government is simple. A college corporation, legally considered, consists of a body of men who have obtained the charter and who hold and administer the property. Where a particular State has established a college or even a university, which regularly includes a college, the members of the corporation are commonly styled regents, and are appointed by the State to hold office for a limited term of years. But most colleges have been established as private corporations. In this case the title is vested in a board of trustees, sometimes composed of members who hold office for life, or else composed of these associated with others who are elected for a term of years. Boards of trustees holding office for life usually constitute a close corporation, electing their own successors as vacancies occur. The two chief functions of such governing bodies, whether known as regents or trustees or by any other name, are to safeguard the intent of the charter and to manage the property. They give stability to our college system. To carry out the main purpose for which the charter was obtained they create a faculty of professors and instructors and entrust the general headship to a president. The president and professors usually hold office for life. In many places provision is made for the retirement of professors on pensions as they grow old. This is usually done with help from the Carnegie Foundation. Instructors and sometimes assistant professors are appointed for a limited time, such appointments being subject to renewal or promotion. In the larger colleges the president is assisted in his administrative work by one or more deans. By immemorial tradition the president and faculty are charged with the conduct of the entire instruction and discipline. They have the power to admit and dismiss students. The conferring of degrees belongs to the corporation, but this power is almost invariably exercised according to recommendations made by the faculty. Honorary degrees, however, are commonly given by the trustees or regents on their own initiative.

In State colleges the income is derived from taxation; in others from endowments, often supplemented by annual subscriptions for special purposes. But the private colleges are cut off from dependence on the State, and have to rely on private gifts. This stream of private liberality flows almost unceasingly. The fact that many colleges are integral parts of real or so-called universities makes it difficult to say how much the specifically collegiate endowments and incomes amount to. But a few significant facts may be mentioned. No college president, unless he is at the same time the president of a university, receives as high a salary as $10,000 annually. He is more likely to receive $5,000 or $6,000. While $2,000 is considered a fair professor's salary in small colleges, $3,000 is a usual salary in the larger colleges, while few professors receive more than $4,000.

The expenses of individual students vary greatly. In some places there is no charge for tuition; in others they must pay as much as $100 or $150 or more. In little country colleges the total cost for a year often falls within $300; in the larger old eastern colleges, drawing patronage from all parts of the land, the student who must pay all his bills and receives no aid in the form of a scholarship can hardly get along with less than $600 or $700, exclusive of his expenses in the summer vacation. The average expenses in some of the oldest colleges, according to tables prepared by successive senior classes, is higher than this, running up to $800 or $900, or even more. But these institutions afford the student of limited means multiplied opportunities for self-help. Moreover many colleges possess scholarships which are open to able students who need temporary pecuniary help. The young American of narrow means, if he be of fair ability and industry, can almost always manage to find his way through college.

The College Is American.— The college lies very close to the people. Distinctions of caste may manifest themselves occasionally, and yet the college is stoutly and we believe permanently democratic. Its relation to the better side of our national life has been profoundly intimate from the beginning. The graduates of Harvard and Yale in New England, of Princeton and Columbia in the Middle States, and of the College of William and Mary in Virginia contributed powerfully to the formation of our republic. Edmund Burke attributed the "intractable spirit" of the Americans to "their education," and by this he meant the college education. "The colleges," wrote President Stiles, of Yale, shortly after the Revolution, "have been of signal advantage in the present day. When Great Britain withdrew all her wisdom from America this revolution found above 2,000 in New England only, who had been educated in the colonies, intermingling with the people and communicating knowledge among them." John Adams of Harvard delighted to find in President Witherspoon of Princeton "as high a son of liberty as any in America." Hampden-Sidney College in Virginia, founded about the time of the Revolution, incorporated in its charter the following clause: "In order to preserve in the minds of the students that sacred love and attachment which they should ever bear to the principles of the ever-glorious Revolution, the greatest care and caution shall be used in selecting such professors and masters, to the end that no person shall be so elected unless the uniform tenor of his conduct manifest to the world his sincere affection for the liberty and independence of the United States of America." And from that day to this the collegiate spirit and the national spirit have been at one. Rightly, indeed, did our appreciative French visitor, Baron Pierre de Coubertin, perceive that the place to find "the true Americans" is in our college halls; "*les vrais Americains, la base de la nation, l'espoir de l'avenir.*" Scarcely one in a hundred of our white male youths of college age has gone to college. But this scanty contingent has furnished one-half of all the Presidents of the United States, most of the justices of the Supreme Court, not far from one half of the Cabinet and of the national Senate, and almost a third of the House of Representatives. It has furnished a great contingent to the professions and almost the

entire personnel of the best faculties of law, medicine and divinity. It is increasingly represented in business and engineering and the leading newspapers and reviews. No other single class of equal numbers has been so potent in our national life. See AMERICAN UNIVERSITY; COLLEGE, ENTRANCE REQUIREMENTS.

ANDREW FLEMING WEST,
Dean of the Graduate School, Princeton University.

AMERICAN COLLEGE IN ROME, Italy. This pontifical college, the legal title of which is "The American College of the Roman Catholic Church of the United States, Rome, Italy," was founded 8 Dec. 1859 by Pope Pius IX for the purpose of training young men for the Catholic priesthood in the United States of America. A tablet in the building commemorates the visit of Pius IX on 29 Jan. 1860. By a pontifical decree it was placed under the direction of the Congregation of the Propaganda, the students being obliged to attend the courses of lectures given at the University of the Propaganda. The regular course embraces two years of philosophy and four years of theology, while preparatory classes are held for students who have not completed the college course in their own country. The American College opened with 12 students, three of whom afterward became achbishops: Michael Corrigan, of New York; Patrick Riordan, of San Francisco; and Robert Seton, titular of Heliopolis. Ruben Parsons, the historian, was also one of the original 12. The college has trained many distinguished churchmen during its existence of 58 years. It is administered under the control of a board of four archbishops, those of New York, Boston, Philadelphia and Baltimore; the officials immediately in charge are the rector, vice-rector and spiritual director. Thanks to the solicited intervention of President Chester A. Arthur in 1884 the college was saved from confiscation by the Italian government by virtue of statutes of 1866 and 1867 applying to the property of religious bodies.

AMERICAN COMMERCE. See COMMERCE.

AMERICAN COMMONWEALTH, The, an important study of American political, social and economic conditions by James Bryce, the eminent historian of 'The Holy Roman Empire.' Part I treats of the Federal government. Part II considers the State governments (including rural and city governments), their departments, constitutions, merits and defects. Part III is devoted to the political machinery and the party system. Part IV discusses public opinion,—its nature and tendencies. Part V gives concrete illustrations of the matters in the foregoing chapters. Part VI is concerned with non-political institutions. The work is lucidly written and as easy for the laity to comprehend as for those familiar with the practical workings of our government. The chapters dealing with the professional and social sides of American life, and especially those devoted to the American universities, have been enthusiastically received by Americans.

AMERICAN CONFLICT, The, an account of the American Civil War and its causes, by Horace Greeley. It is a great magazine of materials for the political history of the United States with regard to slavery.

AMERICAN COUSIN, Our, a well-known play by the English dramatist, Tom Taylor (1858). It was very popular in the sixties, and it was while present at its representation in Ford's Theatre in Washington that President Lincoln was assassinated.

AMERICAN DIALECT SOCIETY. The need of an American dictionary like the *English Dialect Dictionary,* to record peculiarities of local American speech, led to the formation at Harvard University, under the auspices of James Russell Lowell and Francis James Child, in 1889, of the American Dialect Society. Since 1890 the society has issued annually (now semi-annually) a periodical, *Dialect Notes,* containing word lists and short articles which have dealt with some 20,000 terms. This may be found in the libraries of most large cities and colleges. The members, chiefly teachers in universities and colleges, meet annually in December in conjunction with the Modern Language Association of America, and read and discuss papers. In addition to the speech of districts, the phraseology of occupations, as whaling, mining, and cowboy lingo, are considered; and the influence of foreign languages receives some attention.

AMERICAN DIPLOMACY. It may be justly claimed that the United States, in its brief existence as a nation, has exercised a greater influence in the same period in molding international law than any other nation; and it has done much to raise the standard of diplomatic practice. From the beginning it has stood as the champion of a freer commerce, of respect for neutral and private property in war and of the most elevated ideas of national rights and justice.

When the United States entered the family of nations, there existed a marked contrast between the state of law which controlled the rights and intercourse of nations and that which enforced the rights and duties of the individual inhabitants of the respective nations. The civil law, which was in force in most of the countries of continental Europe and their colonies, was the accepted product of the ripened experience of many centuries of Roman jurisprudence. The common law which prevailed in England and its colonies had been brought into an established system through the careful study and practical application of successive generations of renowned jurists. But the law of nations was then in its infancy. Only one century had passed since Grotius, who has been styled the father of international law, had compiled his treatise on the 'Rights of War and Peace'; and Vattel had but recently published his 'Law of Nations,' and the principles he enumerated were far from being an accepted code. International law was still in a formative state when the United States began its career. The latter had scarcely entered upon its organized life when the wars consequent upon the French Revolution forced it to consider its rights and duties as a neutral power. It soon learned that there were no established principles which warring nations respected. In referring to its early history, a Secretary of State in 1853 said to the British Minister of Foreign Affairs:

"From the breaking out of the wars of the French Revolution to the year 1812, the United States knew the law of nations only as the victim of its systematic violation by the great maritime powers of Europe."

The first effort on its part toward the maintenance of international rules of conduct was in President Washington's neutrality proclamation of 1793, which, within less than a generation, brought about a complete change on this important subject. The proclamation was a simple announcement of the neutral attitude of the government, and a warning to American citizens to observe it. But the significance of the act was in the strict impartiality of its enforcement, and the resulting legislation of Congress, which became a model for all other nations.

The power of the President to issue such a proclamation based solely upon the principles of international law, without any domestic legislation respecting offenses against neutrality, was seriously questioned, and in 1794 an act was passed defining what were offenses against neutrality and affixing penalties therefor. During the revolt of the Spanish-American colonies so much trouble was occasioned thereby to the United States authorities that the law was carefully revised in 1818, and it has since practically remained unaltered. Hall, one of the latest English authorities on international law, says: "The policy of the United States in 1793 constitutes an epoch in the development of the usages of neutrality. . . . It represented by far the most advanced existing opinions as to what the obligations [of neutrality] were. . . . In the main it is identical with the standard of conduct which is now adopted by the community of nations."

The American colonies, in assuming their independence, established a diplomatic service similar to that of the European countries and it has continued to be so maintained. But the question has often been raised in and out of Congress whether, in the existing conditions of the world, the system is necessary and its utility justifies its expense. With many in the country the diplomatic service is regarded as a purely ornamental branch of the government and its maintenance a useless expenditure of public money. But whenever the question has been made the subject of inquiry by Congress, the various Presidents and Secretaries of State have given their opinions in favor of the utility and necessity of the service, and Congress has continued to authorize it; and it has come to be accepted as a permanent branch of the government.

While the United States has adopted the European system of a diplomatic and consular service, in one important particular the general practice of other nations has not been followed. The service is not made a life career, and no examination or previous experience is required for admission to the posts of minister or ambassador. Appointments are made of persons usually from civil life, and without any previous diplomatic experience. The two systems have their advantages. It does not necessarily follow that because a young man can pass a successful examination he is destined to make an able minister or ambassador. The British and other governments have frequently found it necessary to appoint to the highest posts in the diplomatic service persons from other branches of the administration or from civil life. On the other hand, the system followed by the United States exposes the government to mistakes and sometimes to mortification and ridicule because of the inexperience or inaptness of its representatives. But appointments to the higher posts are generally of persons who have served and gained distinction in legislative bodies or in the professions, and although not experienced in the arts of diplomacy, they are usually able to cope with their colleagues on all subjects where great principles are involved. There is a growing sentiment, however, in the country in favor of at least placing the appointments as secretaries of legation and to the consular service upon a permanent basis. Under rules established by executive order no person is now admitted to the places of secretary of legation or in the consular service without first successfully passing a civil service examination, and promotions from the lower to the higher grades are based upon merit. This action has tended to give stability to these branches of the service.

Up to recent years the highest grade in the diplomatic service of the United States has been that of minister plenipotentiary, but these representatives sometimes complained that they were often humiliated and their usefulness sometimes impaired by the lower positions to which they were assigned in the diplomatic corps. The remedy suggested was to raise the rank to that of ambassador. Secretary Marcy declined to make the recommendation to Congress in 1856. A similar position was taken by Secretary Frelinghuysen in 1884, who said it would be an injustice to the ministers to give them higher rank without increasing their salaries, and that Congress would not vote the allowance commensurate with the mode of life of an ambassador. Later Secretary Bayard claimed that serious inconveniences would arise from introducing "into our simple social democracy . . . an extraordinarily foreign privileged class."

Notwithstanding these objections, in 1893 Congress authorized the appointments of ambassadors to countries whose governments would reciprocate in such grade, and ambassadors are now sent by the United States to London, Paris, Berlin, Petrograd, Vienna, Rome and Mexico. Soon after the reception of ambassadors in Washington the question was raised whether they should have precedence over the Vice-President, but it has been decided against them. The "inconveniences" anticipated by Secretary Bayard have been experienced on more than one occasion, but the innovation seems to be permanently established.

The fiction of international law that ambassadors represent the person of their sovereign in a greater degree than ministers was created at an epoch when there was a recognized distinction between empires and monarchies, and between these two grades and republics. All distinction between sovereign nations has been abolished and they now stand on an equality, but the ambassadorial pre-eminence is still recognized, even in the American democracies.

The diplomatic dress or uniform of an American representative, although an apparently trivial matter, has occasioned considerable dis-

cussion and a varied action on the part of the government. In the early years of its history the diplomatic representative was left without any instruction upon the subject, but when the commissioners to negotiate peace with Great Britain in 1814 went to Europe a simple uniform was adopted, and by a circular of the Department of State in 1817 this uniform was prescribed for the diplomatic representatives at foreign courts. This order continued in force, with some modification during the administration of President Jackson, up to the advent of Secretary Marcy, who prided himself on his republican simplicity. In 1853 he issued a circular which became famous in diplomatic annals, in which the representatives of the United States were advised to appear on public occasions "in the simple dress of an American citizen" unless such costume was objected to by the court to which the representative was accredited. The circular was much criticized, but its spirit was practically approved by Congress in the passage of an act in 1867 prohibiting officials in the diplomatic service from wearing any uniform or official costume not previously authorized by Congress. As by law only officers who have served in the army or navy are authorized to wear a uniform in the diplomatic service, the great body of the corps come under this prohibition.

From the time of Dr. Franklin, the first minister to France, American diplomatic representatives have sought to be distinguished by entire frankness and straightforward conduct. This is indicated in the instruction to John Jay when he was sent abroad on an important mission by President Washington. The Secretary of State wrote: "It is the President's wish that the characteristics of an American minister should be marked on the one hand by a firmness against improper compliances, and on the other by sincerity, candor, and prudence, and by a horror of finesse and chicanery."

Much is said in disparagement of the American diplomatic representatives abroad, and it is not to be disguised that under the system of appointments some unfit and uncultured persons have been found in the service who have reflected little credit on the country. But their discreditable acts have been outdone by the misconduct of the representatives of foreign governments accredited to Washington. This misconduct has embraced flagrant violations of international law and practice, intermeddling with domestic politics, and official and social improprieties of various kinds. Within the first century after the organization of the government, a list was created of foreign diplomats dismissed by the government of the United States, or recalled in disgrace, which embraces three British ministers, two French, two Spanish, one Russian and one Austrian minister. No such record of dishonor can be compiled against American representatives as that made at the seat of government of the United States by the representatives of the most polished nations of the Old World.

The War of 1812, undertaken by the United States against Great Britain, was pre-eminently a struggle on the part of the former to maintain and enforce correct principles of international law. It involved the claim by Great Britain of the right of visitation of neutral vessels and the impressment of such of their crews as the visiting party saw fit; the doctrine that free ships make free goods, or the exemption of innocent neutral commerce from seizure in time of war; and the paper blockades which were sought to be enforced by the warring powers. None of these questions were settled by the terms of the treaty of peace between the United States and Great Britain. But the contention of the United States as to all of them has come to be accepted by all the nations of the world and by none of them more heartily than by Great Britain. The right of visitation and search of vessels was a frequent subject of negotiations, but while the British government relaxed the enforcement of its alleged right after the war, its claim was not finally abandoned until 1858, when it formally accepted the contention of the United States. A strange incident in connection with this question occurred soon after that date. During the Civil War the commander of a United States naval vessel arrested a British mail steamer, the Trent, on the high sea, visited her with an armed force and carried away as prisoners two Confederate diplomatic agents en route to Europe. In the United States the naval commander was hailed as a hero, but in England the act was regarded as an insult to the British flag and a just cause of war. A hostile conflict was avoided by the prompt surrender of the Confederate agents and a disavowal of the act, as in direct contradiction to the attitude of the government consistently maintained from its foundation of the immunity of the vessel carrying the American flag.

The claim of the right of impressment (q.v.) was connected with the subject of naturalization and expatriation, which has been the occasion of much diplomatic correspondence and controversy on the part of the United States with European powers. From the beginning of its existence the former has encouraged immigration; liberal laws for the naturalization of foreigners have been passed; and the right of expatriation has been maintained. In this branch of international law this attitude has had a marked effect upon the practice of nations. One of the chief causes of the War of 1812, it has been seen, was because of the impressment of seamen, naturalized citizens of British birth, taken from American vessels. The old common-law doctrine was that no British subject could denationalize himself and that he owed perpetual allegiance to the Crown; but the persistent claim of the United States was finally recognized by Parliament in the Naturalization Act of 1870. The doctrine of expatriation is now generally accepted by the nations and the United States has succeeded in having it embodied in many of its treaties.

The subject of free ships was given much prominence through the armed neutrality during the Revolutionary War, was one of the unsettled issues of the War of 1812 and was finally recognized as a principle to be incorporated into the international code by the great Powers of Europe, as embodied in the Declaration at Paris of 1856. This declaration consisted of four rules, which were, briefly stated, (1) the abolition of privateering; (2) the exemption from seizure of an enemy's goods under a neutral flag; (3) a like exemption of neutral

goods under an enemy's flag; and (4) that a blockade, in order to be valid, must be effective. All of these but the first had been long advocated by the United States, and even the first had been incorporated in its treaty with Prussia of 1785. The latter was plainly in the interest of nations having a strong navy. Nevertheless, the United States was ready to accept them all as rules for the government of nations, but Secretary Marcy proposed to the great Powers that they go one step further and declare that private property of belligerents at sea be exempt from capture. As private property of belligerents on land has been exempted by the rules of war, there would seem to be no sufficient reason why the same treatment should not be applied to like property at sea. President McKinley instructed the American representatives at The Hague Conference of 1899 to advocate it, but they were not successful. President Roosevelt continued to urge upon the nations this advanced measure to mitigate the ravages of war, but it has not yet been inserted in the international code.

The fourth rule of the Paris Declaration was, in effect, a formal recognition of one of the principles contended for in the War of 1812, that there can be no blockade by mere proclamation. Its application bore heavily upon the United States during the Civil War, but it consistently observed the principle by making its blockade of the Southern ports effective. An effort has been made of late years to establish what is known as a specific blockade, by which one or more states seek to bring constraint upon another state by closing its ports without a declaration of war. In the case of the blockade of Crete by the great Powers of Europe in 1897, the United States declined to concede the right as applicable to its commerce; and when a similar attempt was made in 1902 of a pacific blockade of Venezuelan ports by Great Britain, Germany, and Italy, the objection of the United States to its interference with American vessels led to the abandonment of the project and to the establishment of a real war blockade.

The subject of neutrality assumed an important phase during the War of the Rebellion, and the duties and responsibilities of a neutral state were the occasion of a heated controversy with the British government. Although the latter had incorporated in its laws the substantial provisions of the United States statutes of 1818, it dissented from the position asserted by the United States as to its duties in the practical application of its acts of Parliament and the recognized principles of international law. The construction of Confederate cruisers in British ports and the aid afforded them in such ports was held to be a failure on the part of that government to discharge its duties as a neutral power, and for these acts the United States made grave complaint and filed a large claim for pecuniary damages. After much discussion the matter was submitted to the arbitration of a tribunal, which met at Geneva (see GENEVA CONVENTION). In the treaty providing for the arbitration there were inserted three rules as to neutrality which were to govern the arbitrators in their decision. These rules were based upon the American statute and mainly followed the contention of the United States. The result was a decision in favor of the latter, with a large award in damages. The two governments had agreed in the treaty that they would submit the rules to the other maritime powers for their acceptance, but this was never done, chiefly because of the extreme construction placed upon some of their clauses in the opinions of the neutral arbitrators. The general concensus of publicists is that these rules are a correct statement of existing international law.

The great European War has brought into discussion the various phases of the duties and privileges of neutrals, the freedom of the areas, the effect and requirements of a blockade, the attack on merchant ships by vessels of war and the changes in the modern methods of warfare. This discussion and the spirit of retaliation on the part of the belligerents, which has led to a disregard of heretofore recognized rules of international law, will make necessary a re-examination of these questions on the re-establishment of peace.

One of the conspicuous features of the relations of the United States with foreign nations is its readiness to accept arbitration for the settlement of questions that do not prove susceptible of adjustment by diplomatic methods. It has been one of the foremost of the nations in advocating this method of arranging international complications, and in preserving peace by means of treaties of arbitration. The first treaty negotiated after the organization of the government under the Constitution — the Jay Treaty (q.v.) of 1794 — was made with Great Britain to avert war which was then imminent. It contained provisions for the adjustment of three of the most irritating of the questions in controversy by a reference to arbitration, and three separate commissions were created for that purpose. The year following, the second treaty negotiated by the new government, that with Spain of 1795, also contained a provision for arbitration. The country was not so fortunate in its second controversy with Great Britain. The questions at issue were of such grave character that it did not seem possible at that day to settle them by any other method than a resort to war; but by the treaty of peace of 1814 four boards of arbitration were created to settle boundary questions. These all related to the frontier with Canada, which ever since the independence had been a source of almost constant discussion, often of angry controversy, and more than once had brought the countries to the brink of war. But in every instance when the usual method of diplomacy failed, arbitration has been resorted to with success.

During the two generations which followed the War of 1812 all questions of controversy with foreign powers, with one exception, have been settled by peaceful methods. In that period the United States created many courts and commissions of arbitration. The most of these have been with Great Britain, but more than 20 of them have been with other nations of Europe and America. The controversy growing out of the manner in which the British government enforced the neutrality laws during the Civil War for a time threatened the peaceful relations of the two countries. When the offer of the United States to adjust the question by arbitration was made, the British government in the first instance assumed the position that its national honor was involved, and

that that could not be submitted to arbitration. But better counsels prevailed, and the Tribunal of Geneva was created to adjust the controversy. It was the most important arbitration in which the United States ever engaged, and was one of the most august and imposing ever held in the world. It involved questions of supreme importance and pecuniary claims of great magnitude; but its special significance was in the spectacle of two great nations being able to compose weighty matters, which had awakened the passions of their people to a high state of bitterness, by an appeal to reason and the arbitrament of friendly powers in place of war.

Next in importance for the United States to the Geneva arbitration was that relating to the protection of fur seals in Bering Sea, held in Paris in 1893. The decision of the tribunal was against the contention of the United States, and as a result it had to pay about half a million of dollars in damages and sustained a heavy loss in its annual income from the seal islands. Disappointment was felt over the result, but the mature judgment of the country is that it was a wiser settlement of the questions at issue than to push them to the extreme of war.

One feature of the many arbitrations in which the country has engaged is worthy of special notice. A spirit of equity and fair dealing has always marked the conduct of the government in cases where any suspicion of fraud or exaggerated damages has attached to arbitral decisions. The commissions with Venezuela, Haiti, Mexico and other countries might be cited in illustration. They show that, though the government is sometimes misled by designing claimants or by the unwise action of its diplomatic agents, it has not hesitated when fully possessed of the facts to undo any injuries inflicted upon friendly powers by means of international commissions, and that fraud, once exposed, cannot reap the benefit of its iniquity under the cover of the finality of an award.

The Alaska Boundary Tribunal of 1903 is an instance of the settlement of a question not possible of adjustment by diplomacy and not deemed appropriate for reference to arbitration. A court was constituted, composed of three members from each country, and they were empowered to judicially settle the questions submitted to them. The danger feared was that there would be an equal division of the court, but in this case the matter was settled by an award rendered by a majority of the members which has been accepted by both governments.

This brief review shows that in its short career the United States has had an important part in molding the code of international law. The chief actors in the work done by this country have been the Secretaries of State and its diplomatic representatives abroad. But they have had worthy coadjutors in giving this code shape and permanence. The exposition of the law of nations, as set forth in the decisions of the Supreme Court of the United States, has had a great influence in molding that law, and its opinions are recognized as of the highest authority by foreign publicists. Among authors in this department of law none carry greater weight throughout the world than Story, Kent, Wheaton, Halleck, Woolsey, Wharton and other American writers. When the services are recalled of these diplomatic, judicial and scholastic representatives of the United States, it is just to say that no body of men in any country have done more to improve and enlarge the principles of international law, or have exercised a more salutary influence on the affairs of the globe. See ARBITRATION, INTERNATIONAL; DIPLOMACY; INTERNATIONAL LAW; MONROE DOCTRINE; UNITED STATES — THE DIPLOMACY OF.

JOHN W. FOSTER.

AMERICAN DIPLOMATIC RELATIONS. For the diplomatic relations of the United States with other countries see the articles on the diplomatic relations with the various nations under their respective titles, AFRICA; AUSTRIA-HUNGARY; CANADA; CHINA; CUBA; GREAT BRITAIN; FRANCE; GERMANY; ITALY; JAPAN; RUSSIA; SPAIN, etc.

AMERICAN ECONOMIC ASSOCIATION, The. This association was organized in 1885 at Saratoga, N. Y. The purpose of the association is: (1) The encouragement of economic research, especially the historical and statistical study of the actual conditions of industrial life; (2) the issue of publications on economic subjects; (3) the encouragement of freedom of economic discussion. It has at present a membership of 2,500, composed of persons interested in the study of political economics or the economic phases of political and social questions. It has published many volumes consisting of papers on economic questions, and the association also issues a quarterly publication, *The American Economic Review.* The association holds an annual meeting, when papers are presented on economic questions, which are afterward published in the Proceedings of the Association and furnished free to all members.

AMERICAN ELECTRO-THERAPEUTIC ASSOCIATION, a society formed in 1890 for the promotion of knowledge in whatever relates to the application of electricity in medicine and surgery. Membership 280.

AMERICAN EMBARGO. See EMBARGO.

AMERICAN ENTOMOLOGICAL SOCIETY, an association for the investigation of the character and habits of insects, founded at Philadelphia in 1859, incorporated in 1862, and known until 1867 as the Entomological Society of Philadelphia. The results of its investigations are published in its Proceedings and Transactions, beginning in 1861, and also in the *Entomological News,* the latter issued monthly with the co-operation of the entomological section of the Academy of Natural Sciences of Philadelphia. It owns a valuable entomological collection and library. Membership 140. Office of the Secretary, Philadelphia, Pa.

AMERICAN EXPANSION POLICY. There is no more significant movement in modern history than that of the migrating procession which, receiving its start from European conditions and breaking barrier after barrier, swept across the American continent within the last century and finally established American influence and enterprise in the Pacific and at the portals of the awakening Orient. The feverish, restless, ceaseless westward movement from the tidewaters of the Atlantic coast, slow at first, but gradually gaining momentum

and force, furnishing new opportunities to interest and awaken delinquents, creating new necessities to stimulate inventive genius, adding territory after territory to the American Union, and extending American commerce and beneficent influence to distant lands and peoples, is the great central fact of American history. Expansion, non-parasitic, vigorous and attractive, developing by affinity, contending against both restriction and secession, has been America's greatest feat. Expansion of national territory, which in earlier American history was a steady policy, has, with few exceptions, arisen from natural forces or some vital issue — from the necessity of meeting internal or foreign difficulties or from political and economic questions—and probably was inevitable. Although the opposition to slavery was an obstacle to expansion, the Southern desire to extend this institution was an important factor in all the acquisitions and the demands for expansion from 1820 to 1860. In the decade before 1860 annexation was urged by the combined arguments of "manifest destiny" and "international nuisance." Jealousy or fear in regard to the plans of some European power exerted no inconsiderable influence in determining the policy to incorporate Louisiana, Florida, Texas, California, Oregon, Alaska and other territories. On this ground the acquisition of Cuba and Yucatan was also urged. Although some acquisitions have been made by war, the greater part have been obtained under the desire to prevent war. The American policy, with few exceptions, has been to negotiate directly with the governments exercising authority over the territory desired, but in many instances diplomacy contributed principally to justify and confirm expansions already made by the people. The processes of annexation were mainly the fruit, not of artificial intrigue and machination, but of the natural economic and social development of people chiefly engaged in the great human occupation of making a quiet living by agriculture. Each acquisition excited both domestic and foreign opposition and also pessimistic prophecies; but time has proved that extension to the Gulf and to the remote Pacific added strength to the Union. In the dark days of the Revolution there was a buoyant American spirit urging that the Union should include Canada, British West India Islands and even Florida; but American expansion began with Clark's invasion of the Northwest, which aided American diplomacy to secure the extension of the western boundary to the Mississippi in the treaty of 1783. The Constitution of 1787 did not expressly provide for annexation of territory but its makers foresaw annexation. In 1791, Jefferson, the great American expansionist, who had already favored exploration westward to the Pacific, acting as Secretary of State under Washington, opened negotiations for the acquisition of Florida and New Orleans from Spain. In 1803, as a result of the western struggle for the mouth of the Mississippi, driven by necessity and accident, before he knew exactly what he was doing, he began the American policy of peaceful expansion by the purchase of a vast empire, setting American bounds to the Rockies, bringing doubtful titles to Florida, Texas and Oregon, and making further expansion necessary and a great united nation possible. Already (in 1801) he had looked forward to the time when "American multiplication shall expand itself and cover the whole northern, if not the southern, continent." In this he probably expressed an idea similar to that advocated by William Thornton in favor of extending the republican system over all North and South America and the adjacent islands, under 13 distinct sections but united by one central government on the Isthmus of Panama. Later, in 1816, T. L. Halsey, writing to Monroe from Buenos Aires, indicated that it was the American policy, "that the whole continent of America should be united, at least in commercial relations."

Jefferson's example was followed long after his authority ceased. The imagination of the pioneer soon passed the limits of the treaty, but with loyalty to the United States, to struggle for disputed regions or for regions clearly foreign. Madison, from apparent necessity, took temporary control of the Gulf shores from the Mississippi to the Mobile and, in the War of 1812, planned expeditions for the conquest of Canada. Monroe, for the same reason, seized Amelia Island and Galveston, finally extended the American domains to the Florida straits, and said that the acquisition of Cuba might become necessary to the internal tranquillity and prosperity of the United States. By 1820, the national road and the steamboat were beginning the large influence which they later had in the development of the West and the Americans were preparing to make settlements on the far-away Columbia. Monroe, in 1822, discouraged the wishes of Guatemalans and Cubans for annexation. Jefferson, although opposed to annexation that would require the construction of a navy to defend it, favored the annexation of Cuba. John Quincy Adams, who in 1820 suggested the occupation of territory in the South seas and foresaw American destiny in the West Indies (especially in Cuba and Porto Rico), later announced that he was inclined to seek no acquisition of non-contiguous territory. His efforts in 1825 to purchase Texas which had been given up in 1819 were followed by the premature Fredonian republic of 1826 which foreshadowed the later struggle for Texan independence. Jackson continued the negotiations for the purchase of Texas, and also wished to acquire territory that would include the Bay of San Francisco on the Pacific, but he expressed no desire for insular possessions. In his administration, the natural course of events was preparing for expansion along the Gulf toward the Rio Grande; and in 1837–38 citizens along the northern frontier were ready to aid the movement for Canadian independence as a step toward annexation. In 1843, Oregon through an organization for the protection against wolves established a provisional government in preparation for American occupation. In 1844, American consuls in California were planning for American occupation to prevent supposed European designs for annexation. In 1845, after the annexation of Texas, the opportunity to meet American needs on the Pacific was furnished by the Texan boundary dispute, which enabled Polk to acquire a vast territory abutting on the Pacific, and thereby to lay the foundations for making the United States a great railway nation and an arbiter in the affairs of

the Pacific. American extension to California, increasing American interest in the Pacific and resulting in negotiations for isthmian transit routes across Mexico and Central America, stimulated agitation and negotiations for territory or protectorates both in the Pacific and in the Caribbean-Gulf region. In the twelve-year period of pro-slavery land hunger which followed, there were plans for acquisitions in Central America and Mexico. Many prominent men advocated the acquisition of isthmian and insular possessions, urging that the United States should hold the gate to the Pacific and the key which controlled it. They opposed the Clayton-Bulwer treaty because it restricted the right of occupying territory which might become necessary for the security of communications. Cuba, especially, standing warden to the Gulf of Mexico, having the institution of slavery which the South wished to see continued, and a system of commercial restrictions and arbitrary government which many others desired to see ended, became an object of anxious solicitude to a large party in the United States. Polk's "profoundly confidential" negotiations for the purchase of Cuba failed, and Fillmore considered that its incorporation would be perilous, but plans for its acquisition continued to be urged. Young America, intoxicated with the progress of a hundred years, and suffering from flights of oratory, joined hands with the slavery extensionists to preach from the text of "manifest destiny." Every addition to the territory of the American Union had given homes to European destitution and extended representative government, and it was now boldly proclaimed by Southern leaders that the American nation was not to be circumscribed by narrow isthmuses and gulf streams. The feature which characterized the foreign policy of Pierce, and especially that of Buchanan, was the aim to achieve the long-desired result of securing control in the Gulf of Mexico and the Americanization of the region thereabouts. In 1856 Senator Bell of Tennessee said the Monroe Doctrine had become a doctrine of progressive absorption, annexation and conquest of Spanish America. The Pierce administration contemplated the annexation of Hawaii and Alaska, opened negotiations for the purchase of Cuba, and, while Walker was filibustering in lower California, sent Gadsden to secure a large slice across Mexico from the Gulf to the ocean, but secured only the Mexican territory along the Gila River. In 1856, after a riot at Panama, the Pierce administration, in order to protect the transportation of persons and property on the isthmus, unsuccessfully attempted to obtain (by treaty) from New Granada a belt of land 20 miles wide from ocean to ocean and certain islands in the harbors at each terminal for naval stations. Seward said it was hard to conceive how the United States much longer could avoid the expansion which had not only brought the Antilles under American surveillance, but also had brought the United States to confront the islands and coasts of Asia. The need of coaling stations in the Pacific, and of an interoceanic canal, had been urged, especially since the rapid growth of California. Commodore Perry and the American Minister to China recommended the establishment of colonies in the Pacific at the gates of China and Japan.

When Buchanan stepped into the shoes of Pierce he announced expansion to be the future policy of the country. He continued to press the necessity of purchasing Cuba; suggested intervention in helpless, bleeding Mexico, where he hoped to secure additional territory or to establish a protectorate; recommended the occupation of Sonora and Chihuahua; proposed to send land and naval forces to Central America in order to protect the transit route; threatened the Fiji Islands, and was favorably disposed to the annexation of Alaska.

The Civil War, inaugurating changes of policy and resulting in the abolition of slavery, ended the agitation for the extension of dominion over tropical peoples disturbed by dissension and strife, although the difficulties of the blockade of Confederate ports emphasized the need of harbors in the West Indies. The Lincoln administration found little time for a policy of acquisition, although it contemplated acquisition of tropical territory for the colonization of free negroes, and, in order to prevent lower California from falling into the hands of the Confederates, was willing to buy or take it as a pledge for a loan to Mexico to meet foreign obligations which endangered foreign intervention. While warning Spain against intervention in Spanish America, and assuring her that her rights in Cuba and Porto Rico were respected by the United States, Secretary Seward significantly added that Cuba must not be used as a base against the American Union. Later in the war (1864), when Spain feared American designs on Samana, he said the United States already had enough territory. At the close of the war, when Maximilian slept and the Fenians blustered, the American government, in spite of various predictions and certain tendencies, showed no disposition to interfere with the operation of natural forces by embarking upon a policy of conquest. Encouraged by friendly inviting conditions in the Red River region and in British Columbia and instigated by the desire to compel England to pay large damages for injuries resulting from Confederate cruisers built in English waters, many favored annexation of British America; but the American government under President Grant refused to adopt the "flag-withdrawal" policy. The purchase of non-contiguous distant Alaska, however, was regarded, not only as a friendly part of a general policy to extinguish European colonial connection in America, but especially as a step toward the annexation of Canada and other territory. In the same year a representative of the American navy formally took possession of the Midway Islands in the Pacific. The public mind was at the time too much absorbed in domestic questions to consider additional annexations. A treaty of 1867 for the purchase of the Danish West Indies was never ratified by the American Senate; and another of 1869–70 for the purchase of San Domingo, partly with a view to the solution of the race problem, failed of ratification in the Senate. During the Cuban insurrection of 1868–78 the American government in order to secure peace was ready to guarantee a payment by the Cubans to Spain for their independence, but several times disclaimed any desire for the island.

In 1873, when events in Hawaii threatened to precipitate the consideration of the expediency of its annexation, Secretary Fish, while reflecting upon the possible necessity of future expansion into midocean, said the acquisition of territory beyond the sea met the opposition of discreet and influential leaders and could not be adopted without grave deliberation. In 1874, after considering the question of assuming control of the Samoan Islands as a protectorate, he doubted whether their position and importance "would be sufficient to satisfy the people that the annexation of the islands to the United States is essential to our safety and prosperity" and did not see the expediency of originating a measure "adverse to the usual tradition of the government." Evarts in 1877 refused to accept a protectorate over islands so far distant. Blaine in 1881 and Frelinghuysen in 1883 said that the American policy tended to avoid possessions disconnected with this continent — but they felt that the destiny of Hawaii like that of Cuba was an American question. Both Blaine and Bayard, influenced by the absorption of Pacific islands by European powers and the decline of native races, recognized the necessity of maintaining the rights to which the United States had become entitled in the few unappropriated islands which were under independent and autonomous native governments. In 1885 Bayard informed Germany that the recorded disinclinations of the United States to accept the voluntary offers of other powers to place themselves under American sovereignty and protection showed that the American government had no idea of acquiring control of the Carolines, but in 1886 he added that the United States had an equal right with Germany to assert a claim of possession to Pacific islands. The inevitable incorporation of Hawaii was only delayed by the refusal of Cleveland to accept the results of the revolution of 1893. The tendency to favor the acquisition of distant islands for protection of American interests was shown by the annexation of Hawaii as a naval base by joint resolution in 1898, and was increased as an inevitable consequence of the dismemberment of Spanish dominions by the War of 1898. At the close of the war, the American government, desiring to avoid occasion for future collisions with Spain, and to secure naval and cable stations and provide for commercial interests, demanded and obtained Porto Rico, Guam and the Philippine Islands, and secured the independence of Cuba which became practically an American protectorate.

The recent acquisitions in the Pacific are the logical development of the old-time policy of steady expansion of American interests in the Pacific and the Far East, although by the acquisition of the Philippines the government has taken a larger step than heretofore.

As the result of the change to steam power for war vessels, the United States still needs coaling stations in the southern oceans and in various parts of Asia, Africa and Europe.

The successful object-lesson of American regeneration in Porto Rico and of American responsibilities in Cuba and Panama — and more recently in San Domingo, Nicaragua and Haiti — may result in additional acquisitions in the West Indies; but American policy in the entire Caribbean region is to guide the weaker states and not to extinguish their nationality.

The acquisition of the Danish West Indies in 1917 was largely the result of earlier negotiations begun to prevent danger of transfer to Germany, which has for years been devising a means to secure coaling stations and harbors in the Caribbean, and in 1902 influenced the Danish Landsthing to reject an American-Danish treaty for the projected purchase of the islands.

In 1912–14 conditions in Mexico furnished another of the traditional opportunities for American expansion, and a bill for the annexation of northern Mexico was introduced. In March 1914, intervention was urged to prevent German intervention; but other methods for pacification were adopted. President Wilson asserted that the United States will never again seek one foot of territory by conquest.

JAMES M. CALLAHAN.
Professor of History and Political Science, West Virginia University.

AMERICAN FARM IMPLEMENTS. See FARM MACHINERY.

AMERICAN FEDERATION OF CATHOLIC SOCIETIES, The. Founded in Cincinnati, Ohio, 10 Dec. 1901. The Federation is an organization of Catholics in the United States for the purpose of advancing their civil, social and religious interests. It is not a political organization, and does not control the political affiliation of its members; it asks no favors or privileges, but openly proclaims what is just and fair. It aims at the creation of sound public opinion on all important topics of the day; it stands for the Christian life of the nation itself; for the proper observance of Sunday; for the Christian education of youth; for the stamping out of immorality; for the sanctity and perpetuity of Christian marriage; for the safeguarding of the Christian home. It asserts the necessity of Christian principles in social and public life, in the state, in business, in all financial and industrial relations. It combats all errors which are in opposition to Christianity and threaten to undermine the very foundation of human society. It is willing to co-operate with all loyal citizens and with all civil and social energies which work for truth and virtue. It exposes falsehood and injustice, whether in misrepresentation of history, doctrine or principles of morality. The aims of the Federation, therefore, are both religious and patriotic. Its membership is composed of the leading Catholic national organizations, of county and State federations, Catholic institutions and individual societies and parishes, with an approximate membership of 3,000,000. The organization has the endorsement of the American Hierarchy and of the Pope. The advisory board is headed by Cardinal Gibbons, Cardinal Farley and Cardinal O'Connell.

AMERICAN FEDERATION OF LABOR, a federation of trade-unions of the United States, Canada, Porto Rico and Panama, in which the rights of constituent units are preserved intact. As in the Federal government, all powers not expressly granted in the written constitution are reserved to the subordinate bodies, but still further, as in the Articles of Confederation, it has not power of

compulsion (except to suspend or expel a union) and any union can override its decision as far as its own action goes. To this is due its steady growth and harmony. What every union fears most of all is being controlled in matters pertaining to its own trade by persons outside that trade.

The Federation originated in 1881. Its predecessors had been the National Labor Union (1866-72), which ended its career by entering politics and nominating a candidate (David Davis) for the Presidency, and a number of sectional orders, of which the Knights of Labor was the chief (1869). The latter were generally hostile to trades-unions, holding them based on "false and selfish principles of temporary advantage, to the sacrifice of the general interests" of labor, and the Knights attempted to break down trade barriers in workmen's action by organizing local assemblies of miscellaneous laborers. This antagonized those who believed that only members of a given craft, trade or industry had a right or the proper knowledge to direct its action; and on 2 Aug. 1881, representatives from trade-unions, the Amalgamated Labor Union (a split from the Knights of Labor) and the Knights of Industry, both secret orders, held a conference at Terre Haute, Ind., ostensibly to establish a national labor congress, but in reality (as stated) to form a new order to supplant the Knights of Labor. This was defeated, and the conference issued a call for a convention at Pittsburg in November, where the Federation of Organized Trades and Labor Unions of the United States and Canada was constituted. On 8 Dec. 1886, this fused with a separate trade-union conference and changed its name to the American Federation of Labor; and in 1889 acknowledged the continuity of existence by dating the proceedings to 1881. Its membership is of local unions central unions of cities, State federation, national and international trade-unions. As a local union may thus belong to three different superior bodies, with a possible conflict of jurisdictions, the Federation takes charge of these mutual relations. It recognized the national and international unions as having supreme jurisdiction, but it approves and urges State and central bodies as helpers in gaining common objects.

These objects, as stated in its constitution, are: (1) "The encouragement and formation of local trades and labor unions, and the closer federation and combination of such bodies, to secure legislation in the interest of the working masses." (2) "The establishment of national and international trade-unions, based upon a strict recognition of the autonomy of each trade," etc. (3) "An American Federation of all national and international trade-unions, to aid and assist each other," and "the sale of union-label goods, and to secure national legislation in the interest of the working people, and influence public opinion by peaceful and legal methods in favor of organized labor." (4) "To aid and encourage the labor press of America."

Its executive organization at first was a secretary and legislative committee, and it announced that it would have no salaried officials; but for efficient working it has been compelled to modify this rule. It has a salaried president and secretary, a treasurer and eight vice-presidents, who together form the executive council, which meets quarterly. The president for many years has been Samuel Gompers (q.v.)

The funds are derived from a per capita tax in 1918 of 10½ cents per year from each member of an affiliated trade-union, 15 cents per month from each member of a directly affiliated local union, and $10 each from central unions and State federations. Until 1887 it could not grant money in aid of strikes; but in that year a revised constitution gave the executive council the right to call on the unions for financial aid to such strikes as it approved. This voluntary aid was insufficient, and in 1889 another amendment permitted it to levy a compulsory tax of one cent a week on each member of an affiliated union, for not over 10 weeks in any year, in aid of strikes or lockouts.

The policy of the Federation is fixed in open conventions held in a different city each year. For years these conventions were held in November. The 1917 convention changed the time to the second Monday of June. The affiliated organizations are entitled to but one delegate until their membership reaches 4,000, two delegates up to 8,000, three delegates up to 16,000, four delegates up to 32,000, five delegates up to 64,000 and so on. But delegates from organizations, either national, international or local unions, are entitled to cast one vote for every 100 members they represent. Thus the number of delegates is kept within such limits so that the conventions shall be really legislative bodies, and yet the spirit and purpose of democracy is maintained so that the delegates have voting power in proportion to the numerical strength of their respective constituencies.

The American Federation of Labor confines its membership to wage workers, men and women, skilled and unskilled, not admitting even farmers who are employers of labor on their farms. The Federation realized that the organization of each trade in its particular union and the affiliation of all unions in a comprehensive federation was sure to strengthen each and bring advantage to all. The Knights of Labor confounded all distinctions and potentially overruled each trade by the vote of outsiders. By recognizing the common-sense principle that each interest can manage its own affairs best, the Federation has grown, till, for the year ending 30 Sept. 1917, it has in affiliation national and international unions, 111; State federations, 45; central unions, 762; local unions, 26,761; five departments and 441 local department councils. The total membership of unions for September 1917, 2,371,434. It does not contain all the trade-unions, a few are still remaining outside, as the great railroad federation of four unions; but it contains the United Mine Workers of America (its largest body), the International Typographical Union of North America, the Brotherhood of Carpenters and Joiners, the Cigar Makers' International Union, etc.

Its activity in securing favorable and defeating unfavorable legislation for laborers has been very great and very successful. These are too many to detail; but it may be said that its first convention of 1881 demanded a national eight-hour day for government employees and exclusion of Chinese and contract laborers; and all these have been enacted into law. It also

secured the establishment by law of Labor Day. Since then it has steadily favored shorter hours, non-employment of children, better sanitary conditions, regulation of convict employment, abolition of "government by injunction," etc.

The American Federation of Labor during the first part of its history followed the political policy of recommending to the members of its affiliated organizations the independent use of the ballot. This policy was pursued until 1906 when the Federation inaugurated an active non-partisan political policy of rewarding their friends and voting against their enemies. It was felt necessary to make this change of policy because of the urgent need of remedial legislation. Abuse of the injunctive process and the perversion of the Sherman Anti-trust Law to apply to associations of wage-earners organized not for profit constituted such a menace to the activities and the very existence of the organizations of workers that the enactment of laws, regulating and limiting the issuance of injunctions and specifically taking associations of wage-earners from under the provisions of trust legislation, was imperative.

In 1906, the American Federation of Labor drew up its famous "Labor's Bill of Grievances," which enumerated laws demanded by labor for the protection of the rights and interests and welfare of the working people. This political movement was given impetus by legal proceedings instituted against organized wage-earners. The two cases which were endorsed by the American Federation of Labor as test cases were the so-called Hatters' case and the "Contempt" proceedings against President Gompers, Vice-President John Mitchell and Secretary Frank Morrison of the American Federation of Labor. Under these contempt proceedings they were twice sentenced to 12, 9 and 6 months' imprisonment, respectively, but the United States Supreme Court reversed the decision of the lower courts in both cases. In the course of the Hatters' case, the Supreme Court of the United States decided that sections 1, 3 and 7 applied to associations of wage-earners. The contempt cases grew out of injunctions issued against the officers of the American Federation of Labor, forbidding them their constitutional rights of free speech and free press. These two cases were considered flagrant violations of the rights of citizens of a free government and demonstrated the imperative necessity for securing the remedial legislation which labor demanded.

The organized labor movement began a campaign to secure the nomination and election of representatives, regardless of party, who pledged themselves to the enactment of labor's legislative demands.. As a result of this political policy, there came into existence in Congress what is known as the Labor Group, members of which hold trade-union cards and are affiliated with labor organizations. This group has gradually increased in size until in the 65th Congress there are now belonging to it one senator and 16 members of the House of Representatives. As a result of this political activity, labor's fundamental demands have been enacted into law. In the labor provisions of the Clayton Anti-trust Act, which became a law 15 Oct. 1914, section 6 of this act contains the most important legislative statement ever enacted into law, namely, "the labor power of a human being is not a commodity or article of commerce." According to this declaration, associations of wage-earners cannot be classified as trusts and cannot be interpreted as coming under the provisions of trust legislation. Section 20 of the Clayton Anti-trust Act provides for the limitation and regulation of the issuance of writs of injunctions to conform to labor's demands. Another great humanitarian law that has been secured as a result of this political policy is the Seaman's Act, which brings freedom to a group of America's workers that could be imprisoned for failure to perform specific services.

In 1884, the American Federation of Labor succeeded in securing the enactment of a law establishing the Federal Bureau of Labor. After continued effort in 1913, a law was enacted which created the Federal Department of Labor, with a secretary at its head, who is a member of the President's Cabinet. There was appointed, as the first Secretary of Labor, William B. Wilson, a member of the United Mine Workers of America and former secretary of that organization. This enables the workers of America to have representation in the councils of state at the time when plans and policies are in a formative state. Another law provided for the establishment of the Children's Bureau.

In addition, many other humanitarian laws have been secured, such as the amended and improved eight-hour law for employees on government work, Workingmen's Compensation Act and many others too numerous to mention, but which have made possible better conditions of work, greater safety for life and health of the workers of America. However the fundamental policy of the American Federation of Labor has been that the economic power of the workers is fundamental, that power is derived from the creative labor power of the workers who render service in industry and commerce and that all other power is derived from their economic power. The economic demand which the trade-union movement holds to be fundamental is the shorter workday or the present demand for the eight-hour day. The shorter workday protects workers from physical exhaustion and gives them opportunities for rest, for improvement of their own abilities and for social contact with their fellows. The shorter workday makes of the workers different human beings. It is always accompanied by higher wages for the worker who, as a result of the shorter workday, is a better and more productive worker than the one who labors long hours.

The trade-union movement has held that personal relations in private industries must be determined by the wage-earners themselves through their economic organizations. A distinction is observed between employees in private industry and employees in the government. The American Federation of Labor holds that the economic organizations are the instrumentalities through which workers in private industries must work out their salvation but that industrial relations for government employees must, of course, be regulated to some extent through legislation. However, even the

problem of securing the welfare of workers in government employment depends upon the power of the economic organizations of the workers — not only those in government employment but those of the whole country.

The American labor movement has consistently stood for internationalism and peace between nations. It has opposed militarism in all its phases. The Seattle Convention of the American Federation of Labor approved a proposition for a Naval Holiday during which period of time all nations should cease constructing war vessels. Although working for peace and hoping for peace, the Federation understood fully the meaning and the opportunities of the European War. The Federation realized that ideals of international peace had not been properly supported by provisions for constructive agencies. This problem was considered at several conventions held in 1914 in Philadelphia, and a resolution was adopted providing for the holding of a labor peace conference at the same time and place that the world peace congress should be held after the war. The labor organizations of all countries were urged to approve this idea and to make provisions for sending representatives. This plan was reaffirmed by the San Francisco 1915 Convention. The Baltimore 1916 Convention adopted an additional provision that the organized labor movements of all countries should urge upon their governments the justice of appointing workers among their national delegations of plenipotentiaries which would constitute the peace congress. This proposal, together with the proposed labor conference, was again reaffirmed by the Buffalo 1917 Convention of the American Federation of Labor.

The American Federation of Labor was closely in touch with those directing and concerned in the European War and understood that in the last analysis the war was labor's war and the fighting elements in the war were soldiers, sailors and workers. Thus, the essential thing for winning the war was to organize production. Workers performed an essential part in production and therefore demanded that they have a voice in determining conditions under which production shall be carried on.

As the war progressed and it became evident that institutions of democracy and freedom the world over were involved and that therefore the United States could not avoid becoming an active member of the Allies fighting against militarism and despotism, representatives of the organized labor movement of this country met in Washington on 12 March 1917 and adopted a declaration entitled, "American Labor's Position in Peace and in War." That declaration clearly sets forth the duties and responsibilities of workers to a free republic, and made clear the loyalty of labor and its determination to render service to the republic in the time of peril. It also set forth the conditions under which labor could render service and at the same time maintaining the principles of freedom for all. Workers, as representatives of labor, have been appointed to several important governmental committees and agencies dealing with war problems. The president of the American Federation of Labor, Samuel Gompers, was appointed by President Wilson as a member of the Advisory Commission to the Council of National Defense.

In order to facilitate war production and avert situations that might interfere with continuous work, representatives of the organized labor movement have entered into working agreements with the government to secure this end. The most important of these agreements were the agreement between the Seamen's organization and the Shipping Board; agreement between Samuel Gompers and Newton D. Baker, Secretary of War, providing for the union scale and hours in cantonment construction. This agreement was later approved for construction work in the Navy Department and extended to include repairs and the building of warehouses. An agreement was entered into between representatives of labor organizations concerned and the Ship Building Emergency Fleet Construction Corporation covering the construction of ships. The International Longshoremen's Association entered into an agreement with the Shipping Board under which all disputes involving their members should be settled by a labor adjustment board, and which also provided for union hours and wages. The United Leather Workers' International Union entered into an agreement covering war production with various employers and the War Department.

The organized labor movement aims to extend the number and the application of agreements covering war work in order that there may be established agencies for dealing with industrial difficulties as they arise, and thus prevent industrial struggle. It has also maintained the democratic principle that the workers ought to be represented on all war boards and agencies that deal with matters concerning the life and the work of wage earners.

The Federation has taken an important part in international affairs and has steadfastly opposed international conferences of working men in which there were to be representatives of labor movements of enemy countries. However, it has advocated the holding of a world labor congress at the close of the war at the same time and place where the international peace congress shall be held.

The President of the United States accepted an invitation to address the Buffalo (1917) Convention of the Federation. His address to that convention may be found in the printed Proceedings, and also in the *American Federationist* for January 1918.

The Convention adopted the following declaration as Labor's peace program:

1. The combination of the free peoples of the world in a covenant for genuine and practical co-operation to secure justice and therefore peace in relations between nations.
2. Governments derive their just power from the consent of the governed.
3. No political or economic restrictions meant to benefit some nations and to cripple or embarrass others.
4. No indemnities or reprisals based upon vindictive purposes or deliberate desire to injure, but to right manifest wrongs.
5. Recognition of the rights of small nations and of the principle, "No people must be forced under sovereignty under which it does not wish to live."
6. No territorial changes or adjustment of power except in furtherance of the welfare of the peoples affected and in furtherance of world peace.

In addition to these basic principles, which are based upon declarations of our President of these United States,

there should be incorporated in the treaty that shall constitute the guide of nations in the new period and conditions into which we enter at the close of the war the following declarations fundamental to the best interests of all nations and of vital importance to wage-earners:

1. No article or commodity shall be shipped or delivered in international commerce in the production of which children under the age of 16 have been employed or permitted to work.
2. It shall be declared that the basic workday in industry and commerce shall not exceed eight hours.
3. Involuntary servitude shall not exist except as a punishment for crime whereof the party shall have been duly convicted.
4. Establishment of trial by jury.

The American Federation of Labor in 1887 published an official journal called the *Union Advocate*. In 1894 it began the publication of a monthly magazine, *The American Federationist*. In 1911 the Federation began issuing a weekly news letter, for the purpose of assisting the labor press throughout the country. A number of official pamphlets and publications can be had from headquarters. Consult Aldrich, 'American Federation of Labor' (Vol. III of 'Economic Studies' 1898); Gompers, 'The Labor Movement and Others'; McGuire, 'The American Federation of Labor'; and annual reports of the Federation.

SAMUEL GOMPERS,
President American Federation of Labor.

AMERICAN FLAG. See FLAG, THE AMERICAN.

AMERICAN FLAG ASSOCIATION. See FLAG ASSOCIATION, THE AMERICAN.

AMERICAN FOLK-LORE SOCIETY, an association founded in 1888 for the study of folk-lore in general and in particular for the collection and publication of the folk-lore of North America. It has helped largely to lift folk-lore studies out of the mere antiquarian stage and to make them a valuable auxiliary in anthropological and ethnological investigations. Branches have been established in Cambridge, Boston, Missouri and Texas, and flourishing folk-lore societies are in existence in Kentucky, North and South Carolina and Virginia. There is also a large membership-at-large. The permanent secretary is Dr. C. Peabody, Harvard University, Cambridge, Mass. It publishes quarterly *The Journal of American Folk-lore.*

AMERICAN FORESTRY ASSOCIATION, an organization formed in 1882 and incorporated in 1897, devoted to the conservation of private, State and national forests and to public education in the knowledge of trees, their care and development. It is a voluntary organization for the inculcation and spread of a forest policy on a scale adequate for our economic needs and any person is eligible for membership. It is independent and has no official connection. The membership which extends to every civilized country is about 13,000. The publication of the association is called the *American Forestry Magazine.*

AMERICAN FORK, Utah, city of Utah County, 30 miles south of Salt Lake City, on the Denver and Rio Grande, the San Pedro, Los Angeles and Salt Lake railroads. Pop. 2,797.

AMERICAN FURNITURE. See FURNITURE, COLONIAL; FURNITURE INDUSTRY IN AMERICA.

AMERICAN GEOGRAPHICAL SOCIETY. See GEOGRAPHICAL SOCIETY, THE AMERICAN.

AMERICAN GOVERNMENT. See DEMOCRACY; DEMOCRATIC PARTY; FEDERAL GOVERNMENT; GOVERNMENT; LOCAL GOVERNMENT; STATE; STATE GOVERNMENTS; INCOME TAX; CITIES, AMERICAN, GOVERNMENT OF; COMMISSION FORM OF GOVERNMENT; POLITICAL PARTIES; REPUBLICAN PARTY; TOWN AND TOWNSHIP GOVERNMENT; and the various historical articles under UNITED STATES. See also AMERICAN DIPLOMACY; ARBITRATION; DIPLOMATIC RELATIONS WITH AUSTRIA-HUNGARY, CHINA, FRANCE, GERMANY, GREAT BRITAIN, ITALY, JAPAN, MEXICO, NORTH AMERICA, RUSSIA, SOUTH AMERICA (treated under those various countries); FREE TRADE; INTERNATIONAL LAW; NEUTRALITY; PROTECTION; ETC., ETC.

AMERICAN HISTORICAL ASSOCIATION. A national organization of persons interested in history and in the promotion of historical work and studies. It was founded at Saratoga, N. Y., in 1884, by a group of representative scholars, and in 1889 was incorporated by act of Congress, its national character being emphasized by fixing its principal office in Washington and by providing for the governmental publication of its annual reports. Its present membership of 3,000 is drawn from every State of the Union, from Canada and South America, and from 13 other foreign countries. The meetings are held annually in December in cities so situated as best to accommodate in turn the members in different parts of the country. The society has exerted wide influence in directing and stimulating historical research, and its publications and monographs have covered a broad field of historical study. Important committees of the society are the Historical Manuscripts Commission and the Public Archives Commission; the former is concerned in the preparation of valuable manuscripts for publication and the latter in the preservation of the public records of the various States and smaller political divisions. The society publishes an annual report, usually in two volumes, and appoints a board of editors for the *American Historical Review,* published quarterly. The society has published five volumes of 'Papers,' about 40 volumes of Annual Reports, a series of prize essays, two volumes on 'The Study of History in Schools' and a series of reprints of 'Original Narratives of American History' in 20 volumes. Membership is obtained through election by the executive council, upon nomination by a member, or by direct application.

AMERICAN INDIANS. See INDIANS, AMERICAN.

AMERICAN INSTITUTE OF ARCHITECTS, a society organized in 1857. It has 39 chapters, 314 fellows, 809 members, 36 corresponding and 88 honorary members. It has its office in Washington.

AMERICAN INSTITUTE OF THE CITY OF NEW YORK, an organization founded in 1828 for the promotion, by exhibitions and fairs, of agricultural, commercial, manufacturing and artistic interests throughout the Union. It is now divided into five sections: The Farmers' Club, the Henry Electrical So-

ciety, the Horticultural Section, the Photographic Section and the Polytechnic Section. It has a scientific library of 15,000 volumes.

AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS. This is the national organization representing the electrical engineering profession. It was founded in 1884. Its objects are the advancement of the theory and practice of electrical engineering, and of the allied arts and sciences, the maintenance of a high professional standing among its members and the development of the individual engineer. The institute has contributed largely toward the remarkable progress that has taken place in the electrical field during the last three decades, and has been an important factor in advancing the interests of its members and of the entire engineering profession. The membership on 1 May 1916 was 8,212. The annual dues are: Associates, $10; members, $15; fellows, $20. Entrance fees, $5, $15 and $20, respectively. All branches of electrical engineering are represented in the membership. Meetings for the presentation and discussion of technical papers and other matters of interest to electrical engineers are held in New York by the parent society from October to May, and also by the 86 branch organizations located in the principal electrical centres of the country. An annual convention and additional special conventions, as authorized by the board of directors, are held in different parts of the country. The principal publications of the institute are the monthly Proceedings and the annual Transactions. The policy of co-operation with other engineering societies in matters of mutual interest is encouraged by means of joint meetings and otherwise as opportunities develop. Upon invitation, the institute has appointed representatives and committees from time to time to co-operate with various branches of the Federal government, and its representatives have appeared at hearings before congressional and other legislative bodies on subjects involving the interests of the engineering profession. Briefly, the institute provides opportunity for and encourages comradeship, the interchange of ideas, the presentation, discussion and publication of papers, the formulation of standards and codes, the advance of ideals, the cultivation of the spirit of co-operation, and the inspiration which gives vision and incentive for new efforts and greater achievements. Executive offices and library, 33 W. 39th Street, New York.

AMERICAN INSTITUTE OF HOMŒOPATHY, a society organized in 1844, the oldest national medical organization in the United States. Membership about 2,000.

AMERICAN INSTITUTE OF INSTRUCTION, the oldest educational association in the United States, organized in 1830 at Boston. Its purpose was "the diffusion of useful knowledge in regard to education." It has held annual meetings at each of which problems of vital interest were proposed. New England supplies the largest proportion of members. Its proceedings include practically all of the names of well-known educators in the country; among them Ralph Waldo Emerson, William E. Channing, Samuel Howe, Lowell Mason, Henry Ward Beecher, Julia Ward Howe, etc. Some very important contributions to American education were first presented as lectures to this institution. Consult Barnard, Henry, 'American Institute of Instruction' (in *American Journal of Education* 1856, Vol. II, pp. 19–32, 241–55); Smith, "Founders of the Institute" (in 'Proceedings of American Institute of Instruction,' 1867, pp. 213–18); Winship, A. E., 'American Institute of Instruction' (in id., 1906, pp. 457–63).

AMERICAN INSTITUTE OF MINING ENGINEERS, an association of American mining engineers, organized in 1871 and incorporated in 1905. Its membership in 1916 was 5,785.

AMERICAN IPECAC. See GILLENIA.

AMERICAN-IRISH HISTORICAL SOCIETY, founded in Boston, Mass., 20 Jan. 1897, to make better known the Irish chapter in American history. The organization draws no creed lines and is non-political. It has published a number of books and pamphlets along its chosen line of work. The society is national in its scope, and has members throughout the country. The organization holds its annual gathering in New York city, and publishes yearly a bound volume called the 'Journal' of the society. The membership is about 1,000. In addition to the national officers, there is a vice-president for each State.

AMERICANISMS, in language, are words or phrases peculiar to the English speech of the United States or of British America. They may be: (1) Forms originating in America; or (2) forms that have emigrated from Britain and that have continued in use here while they are obsolete there; or (3) that have undergone here an essential change of signification. Examples of words originating here or at least first introduced here into the vocabulary of the English language are Buncombe, Caucus, Gerrymander; of words here in current use but now antiquated in England we have Fall (the season), Wilt (verb), Whittle; and of words with changed signification we have Corn (maize), Partridge (quail or ruffed grouse), Store (in England shop). These three processes of new word coinage, or survival of meanings in one province of the language which in another province have become obsolete, and of essential change of signification, are inherent in all languages, and can be traced in a comparison of two counties as clearly as in two countries. Americanism expresses the character of English speech in America: it does not imply any inferiority of American English to British English; nor is American English subject to correction by the laws that British English prescribes for itself: Americanism and Briticism in speech are mutually on an equal footing; unlike Gallicisms, Germanisms or even Scotticisms, Americanisms are not aliens in English, but natives. Among the Americanisms to be noted in what follows are many words or phrases which belong to the vocabulary and phraseology of slang, and are universally regarded as vulgarisms and solecisms and vicious growths of the vernacular speech of America; as such they are "Americanisms," but they are no more part of legitimate American speech than is costermongers' English part of the English language of the home country.

In the front rank of Americanisms must be classed those which are most racy of the soil and that could not have been evolved in any social or physical environment other than was and is presented in this new world. The first settlers had to clear the boundless forest which covered the land, and constantly to guard their lives and their possessions against the forays of the savages: they went always armed to their day's work. Such words and phrases as Going on the war path, Digging up the hatchet, Burying the hatchet, Scalping, Tomahawking, recall the hero-tales of American pioneering; and from the same period come Shanty, Blazing out, Clearing, Backwoods (in Canada, "the Bush"). They "took to the woods" or "to the timber" for refuge at the approach of the redskins in overwhelming force. In the sparsely peopled settlements the necessity for neighborly help in gathering in the harvest or in erecting a log cabin or in providing comforts for the winter led to the custom of the Raising-bee or Building-bee, the Quilting-bee, the Husking-bee: the origin of the word Bee in this sense is unknown; the custom itself survives in rural districts, and a few years ago a new sort of Bee — the Spelling-bee had great vogue; and that was followed by the Definition-bee; these "bees" met with much popular favor in England. Logrolling is another example of co-operation among backwoodsmen, when neighbors associate to collect each other's logs for the winter fires. Logrolling came early into use as a term of the art of practical politics to signify the co-operation of members of a legislative body to promote one another's schemes. Literary Logrolling is when authors combine to create a market for each other's productions by mutual puffery. Salt springs to which the big game used to resort were Salt Licks; the spaces between stretches of water over which the pioneers had to carry their canoes were Portages. As settlers began to seek homes in the West on government lands, the distribution of the public domain became a business of vast proportions and "a Land-Office business" became a superlative term of comparison. A Section of land is a square mile or 640 acres; a very usual subdivision is the Quarter section, 160 acres. In the nearer West, as in the East, bodies of land were Farms; in the farther West, Ranches; in the South, Plantations. The verb to Deed is a pure Americanism: the phrase "To convey by deed" was too slow. A settler who acquired land from the government "blazed out" his grant by cutting with his axe marks on the bark of trees: the word is from the French *blazon*, a term of heraldry. A Lot of ground is any distinct portion of land, and in towns and cities is a piece of ground with a definite frontage, usually 25 feet. The use of the word "lot" in the sense of a parcel of land seems to have originated with the Puritans in Massachusetts: for this they had scriptural authority, Joshua xv. To go Across lots is to take the shortest route; but to make a Bee line toward a place is to haste to it in a straight line. Immigrant is an Americanism, and it is the accurately fit word to signify one who comes to a country as a settler. Tenderfoot, a most expressive American slang word to designate the newcomer into a newly opened gold or silver mining district, is current coin no less in Australia than in the Rocky Mountains. In California, in the early days, many words came into use and have since remained in general circulation, for example, Placer, Prospecting, Diggings, Pay Dirt, Gulch. Bonanza is of later introduction. Crevasse is a breach in the embankment of a river; the word is of French origin in the province of Louisiana and specially denotes the effect of a flood of the Mississippi River. Of like origin is the word used to designate the embankment of the Mississippi, Levee. The word is also used to designate a river front of towns situate on other rivers in the Mississippi Valley which are naturally confined within their own banks. In English usage Levee is accented on the first syllable, but in the United States the accent falls usually on the last. Incidentally it may be remarked of another American usage of the word Levee to signify an evening reception of visitors by the President of the United States, "the President's Levee," that it is a rank solecism, and means in effect *a morning reception in the evening*. Freshet, in obsolete English usage, means a stream of fresh water: in the sense of an inundation it is an Americanism. Blizzard, signifying a violent, blinding storm of wind, snow and sleet, is a word of unascertained origin. Prairie is as distinctly American as Veldt is South African or as Tundra is Russian and Siberian.

In the vocabulary of politics, besides Logrolling, already mentioned, we have Gerrymander, to make an unfair distinction of electoral districts for party ends: this American political trick is called by the English political philosopher Jerrymandering; and one of the English dictionaries gives as an alternative spelling Jerrymander, while in Gerrymander it makes the g soft: thus pronounced, the word Gerrymander is a Briticism. What for the British is a political canvass is for us a Campaign, and a Campaign is conducted to a considerable extent in accordance with the tactics and strategy of real war. The successful party is the Victor, and to him, under the ancient laws of war, belongs the spoil. Speaking from the Stump, Taking the stump, were originally literal expressions of fact. Buncome, or Bunkum, seems to be authentically derived from the name of a county of North Carolina, whose representative in Congress, when begged not to weary the House with his oratory, replied that though he was addressing the House he intended his speech for the good people of Buncombe. The derivation of the word Caucus from Calkers is plausible. In 1770 the calkers and ropemakers of Boston held frequent meetings to denounce the British government and its local agents, and those meetings were called by the Tories Calkers' meetings. The Caucus, a preliminary meeting held for the purpose of selecting a candidate for office, or, in case of a legislative body, to decide upon the policy to be supported by members of a party in the open sessions, is an American invention; of late it has been introduced in England. Spread-Eagle oratory has its name from the extravagant style of stump orators and Independence Day spouters when they glorify the Bird of Freedom. Highfalutin, a word that cannot be traced to its original source, denotes turgid, bombastic oratory. To Enthuse is unquestionably an Americanism, and it is base coin formed from the word enthusiasm, which, whether in Greek or English, has no corresponding active tran-

sitive verb form. Of party names and nicknames may be mentioned Whig and Tory, of the pre-Revolutionary era, Federal and Republican of the period after independence, then Whig again, and instead of Republican either Democratic Republican or simply Democrat, with the nickname (about 1835) Locofoco (given first to a body of radicals who, in Tammany Hall, New York, after a meeting was officially dissolved and the lights put out, produced locofoco matches, rekindled the lights and continued the meeting: the locofoco match, or locofoco cigar was introduced in 1834, the word meaning "substitute for fire" —*in loco foci*. It was a cigar with friction-match attached). Other party names and nicknames are Republican, Silver-grays, Copperhead, Carpet-baggers, Lily Whites. The man in any political organization who possesses or is believed to possess authority to dictate the party's policies is the Boss. The word is the Dutch *baas* and is the usual designation of an employer or overseer of workmen. A few years ago political terrorism in the South, designed to bar to negroes access to the polls, was known as Bulldozing, a word which cannot be traced to its origin with certainty, and which is no longer in use. Roorback is a false and injurious report set afloat in the crisis of a political campaign, usually a very short time before the canvass is closed, so that it may have damaging effect before contradiction or refutation can be made. The phrase "a good enough Morgan till after election" recalls an incident in the history of New York politics. William Morgan, author of a book purporting to reveal secrets of Freemasonry, was kidnapped, and the anti-Masonry party charged the Freemasons with having murdered him. To counteract this charge, which was credited largely by public opinion, the Masonic society, or rather its friends in the Whig and Democratic parties, spread reports of the finding of the missing man; whether true or false, these reports furnished "a good enough Morgan till after election."

Right, as equivalent to very, is by some writers classed among Americanisms; but that is an error, though undoubtedly the word is more commonly used in that way here than among the English. In the style Right Reverend, Right Worshipful, etc., Right has the meaning of very; in Tyndale's Bible occur such phrases as Right sorry, Right humble, and in writers of the 14th century the same usage is to be seen. But Right here, Right now, Right away, Right off are Americanisms and are not found in the colloquial speech of Britain. In British English of these latter days Sickness is hardly used save in the sense of nausea; but the best British authors do not countenance that restriction of meaning. In the United States, outside the circles in which the time o' day is given from London, the words Sick and Sickness have the same signification they have had in the general language at least from the 14th century, when mind-sick, mind-sickness, were current phrases; and in the King James version of the Bible sick and sickness have the same purport which they have in the American vernacular. Ugly, in the sense of cross-grained, ill-natured, is an Americanism, though English usage has the nearly parallel phrase, an ugly customer. An American can ride in a coach; but an Englishman, if he is to ride at all, must go on horseback or be borne on the back of some other animal. British restriction of the meaning of Ride is inconsistent with the usage of the translators of the Bible, who make Joseph, for example, and Jehonadab ride in chariots. The garment which Americans style Vest is better styled by the English Waistcoat. Peart, pronounced, and often written, Peert, meaning lively, brisk, sprightly, without any suggestion of sauciness or "freshness," is gone out of use, at least of literary use, in England; it is an Americanism, but its habitat, so to speak, is restricted. A special use of Peart is to signify the improved tone of one who is recovering from a sickness.

The place of business at retail which in England is a Shop is in the United States a Store. Of late a tendency has appeared toward adoption of the British usage of these terms. In regions unaffected by this tendency Shop is still what it was 50 years ago in this country, a work-place, and a Store is a place where goods are kept in store for sale. But even while Shop and Store retained their cisatlantic meanings, there were numerous phrases current which are inconsistent with the American meanings of Store and Shop, for example, Shop-worn, Smelling of the shop, Shop-boy, Shopping, Shopkeeper, Shoplifter, etc. The grocer's store or shop is here called a Grocery, not so in England; there Grocery signifies only the wares sold by a grocer. Unquestionably American is the use of the word Drummer in the sense of one who solicits or touts for custom. The phrase, He struck oil, will probably survive after all the oil wells have gone hopelessly dry.

What we call Baggage is by the British called luggage, though the reason of the difference can hardly be that we travel with less impedimenta than they. The development of our railway systems has brought many new words into the vernacular, but none more expressive than the verb Telescope.

The conversational speech of Americans at one time seemed to be seriously threatened with invasion by a host of spurious, illegitimate word-coinages, especially of verbs made out of nouns, as to Advantage, to Ambition, and of pompous verbs made out of nouns ending mostly in *-ation*, as Orate, Donate; but that danger was happily averted. The use of Transpire in the sense of happen, occur, is of American origin, but the use quickly spread to England; the solecism was promptly branded by scholars, but it still lives and flourishes. Balance, in the sense of remainder, is another Americanism which has attained a currency which it does not deserve. Mad, in the sense of angry, is an Americanism of the baser sort. To Wilt, on the other hand, a "provincialism" in England, but in America a word in universal use, is one of the valuable contributions of the American province of the English language to the mother tongue's general store. The proverbial Whittling of the Yankee keeps alive an ancient native English word for knife.

Among notable or curious phrases current in the United States may be mentioned Flying off the handle,— losing self-control through passion: one is then like the axe-head which has quit the haft. To Get religion, or even to Take religion, is a phrase constructed on the pattern

of "to take a cold" or "to take the measles." To be Posted plainly had its origin in the counting-room.

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AMERICANISTS (from *Americanistes*), all those who devote themselves to the study of (1) the native races of America — their origin, distribution, history, physical characteristics, languages, inventions, customs and religions; (2) the history of the early contact between America and the Old World. The name was probably first given to the members of the French Société Americaine de France, and later to students of any nationality who are interested in the archæology, ethnology and early history of the two Americas. Since 1875 such students have met at irregular intervals in an association known as the Congrès International des Americanistes. This congress grew out of the Société Americaine de France, which was formed in 1857 by several French students who had become interested in the pre-Columbian civilizations of South America and Mexico; after this society had flourished for 18 years its members decided to invite Americanists of foreign countries to a congress. The first international meeting was held in 1875 at Nancy, France, where statutes were adopted and plans laid for the continuance of the organization. Since then 10 other meetings have been held in various European cities and two in America (City of Mexico, 1895, and New York city, 1902). At first the intention was to hold biennial sessions, but after a few years it was decided to meet at irregular intervals, the council of each congress determining the time and place of the next session. The meetings have a polyglot character, as speakers may use either French, German, Italian, Spanish or English. The addresses may be either written or oral and are limited to 20 minutes in length. All papers presented may, with the approval of the committee, be issued in the printed 'Proceedings' which are usually in French (Congrès International des Americanistes, Comte-Rendu'), and published in two volumes for each meeting. In addition to the papers the reports contain lists of the members enrolled and minutes of the business transacted at each session. Any one interested in the subjects discussed may become a member of any congress by a subscription ($3, American money, or an equivalent in the currency of the country where the congress meets), which entitles him not only to take part in the sessions but to receive the reports of the congress and all other publications issued by it. The subjects considered at each meeting range through meteorology, geology, archæology and ethnology to comparative philology, the history of the pre-Columbian arts and religions, the early discoverers of America and its early relations to European nations. Representatives from almost every nation, even from China and Japan, are found on the lists, which have included as members (not necessarily as attendants) many of the most eminent archæologists, ethnologists and anthropologists in Europe, England and America. For a full account of the 13th congress, held at the American Museum of Natural History in New York city 20–25 Oct. 1902, see *Science*, New Series, Vol. XVI, p. 884. Previous meetings are reported in *Nature*, Vol. XIV, p. 355; *Popular Science Monthly*, Vol. XXXIV, p. 686, and Vol. XXXVIII, p. 685. The 19th International Congress of Americanists was held in 1915–16 at Washington in conjunction with the Anthropology section of the 2d Pan-American Scientific Congress.

AMERICAN JEWISH HISTORICAL SOCIETY. This society was founded at a meeting held in the city of New York 7 June 1892. Its purpose is to collect, preserve and publish material having reference to the settlement and history of the Jews on the American continent, and to promote the study of Jewish history in general, preferably so far as the same is related to American Jewish history or connected with the causes of emigration from various parts of the world to this continent. In fulfillment of these objects the society maintains a library and museum in the building of the Jewish Theological Seminary of America in the city of New York and has issued a series of volumes known as 'Publications,' 25 issues of which have already appeared, and an index volume of the first 20. The researches of the society, which have covered South America, Mexico, parts of Europe and Asia and the whole of the United States, as embodied in the papers and material comprising these 'Publications,' indicate the presence of Jews on this continent since 1494 and their participation in the upbuilding of the colonies and the later

American nation since 1655. The society had, on 1 July 1916, a total membership of 383 persons. Its first president was Hon. Oscar S. Straus, with Dr. Cyrus Adler as the first corresponding secretary. When, in 1899, Mr. Straus went to Turkey as United States ambassador he declined a re-election as president and Dr. Adler succeeded him. The latter has been chosen in that office annually since this date. The corresponding secretaries of the society, since Dr. Adler's election as president, have been Dr. Herbert Friedenwald, Max J. Kohler and Albert M. Friedenberg. The last-named who is the present incumbent was first chosen in 1910.

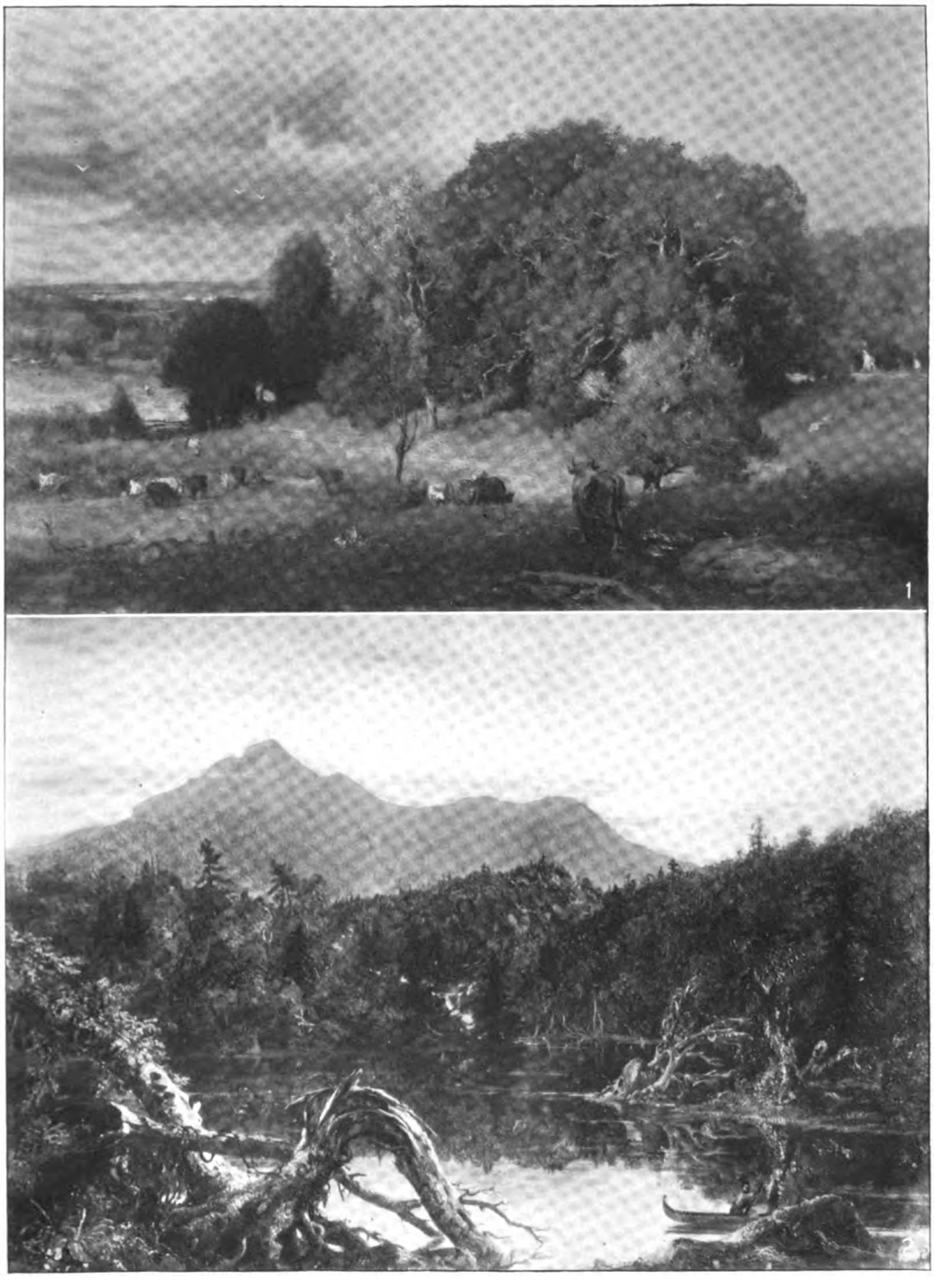
AMERICAN LABOR. See AMERICAN FEDERATION OF LABOR; LABOR LEGISLATION; LABOR MOVEMENT, AMERICAN; LABOR UNION.

AMERICAN LAKES, Neutrality of the. During the War of 1812 each party struggled to secure control of the lakes. In the negotiations for peace the British demanded military control of these waters to prevent the expense of rival armaments. This proposition of a one-sided disarmament was not accepted; but after the treaty of peace was concluded, the American government decided that mutual disarmament was the only assurance against collision which might result from various sources of misunderstanding, and early in 1816 suggested through John Quincy Adams to Lord Castlereagh at London that some such measure should be accepted by both governments to avert the threatened evil of rival naval forces upon the Lakes. After debates in Parliament, Lord Castlereagh instructed Mr. Bagot, the British Minister at Washington, "to take ad referendum any such proposal." In August 1816, Secretary Monroe submitted to Bagot the precise project providing for limitation of the force on the Lakes to one vessel on Lake Champlain, one on Lake Ontario and two on the upper lakes, each of 100 tons burden and with one 18-pound cannon. This force was to be restricted in its duty to the protection of the revenue laws, the transportation of troops and goods, and such other services as world not interfere with the armed vessels of the other party. Early in 1817, Castlereagh acceded to the proposition and later in the year the agreement was completed by the exchange of notes between Mr. Bagot and Acting Secretary Rush. By the agreement all naval vessels except the four allowed were forthwith dismantled and no other vessels of war were built or armed upon the Lakes. The arrangement doubtless contributed to the century of peace along a boundary of 4,000 miles, the longest international boundary in the world. Consult Callahan, J. M., 'Neutrality of the American Lakes' (1898); Foster, J. W., 'The Agreement of 1817' (Ex. Doc. 1892).

J. M. CALLAHAN.

AMERICAN LANDSCAPE PAINTING. Landscape has always been a characteristic and distinctive element in American painting. Just as there is something especial in American writing on nature in the work of Thoreau, Burroughs, Muir, so there is something especial in the American painting of nature. In the early days the natural scenery of America was of great interest to visitors from abroad and to many Americans who looked beyond practical matters. American scenery was magnificent and vast,— sublime. The unending forests, the inland seas, the great rivers with their many waterfalls, and somewhat later the extending prairies and the enormous mountains, these were by all held to be characteristic of America. In the early days there was little painting of any sort. By the end of the 18th century attempts were made to render the remarkable things in American nature; there are not a few engravings of American scenery, mostly by Europeans, but some by Americans, of whom Jacob Hoffman is the only one remembered. With the new century there came a number of other renderings, topographical drawings, engravings of gentlemen's country-seats (William and Thomas Birch), illustrations in the few magazines (Portfolio), landscape backgrounds in books on natural history (Wilson, but particularly Audubon), collections of landscape engravings or aquatints. Such things show a widely developed taste, which, however, found no adequate expression until Thomas Cole came to New York in 1825. Earlier were W. G. Wall and W. Bennett, Thomas Doughty and Alvan Fisher. The first two painted American scenes which were often engraved and became popular. The last two had each a definite character, Doughty for his refined, painter's view of nature, Fisher as one who could paint a romantic story. Thomas Cole was the first to become generally recognized, the first to present the view of romantic America that had long had its place in the general mind. He felt deeply the grandeur of the American scene, particularly in its wilder and fiercer aspects. He was not satisfied, however, with presenting these things as truthfully as he could, but sought to express the ideal conceptions that arose in his mind ('The Course of Empire,' 'The Voyage of Life') in landscape form. A. B. Durand held more strictly to the landscape ideal and also to a closer method. His work aimed first at a truthful representation of nature. He preferred quieter scenes and the more restful phases of nature. Cole and Durand are often thought of as the leaders of the landscape painters of their time, who are loosely grouped as the Hudson River School. Of these some — Kensett, Casilear and Whitredge were more like Durand in their appreciation of a more intimate conception of nature even on a large scale. Others, like Cole, sought to render vast and grandiose aspects. Cole had confined himself chiefly to the Hudson and Lake George, the Catskills and the White Mountains, and so did many who followed him as Sandford R. Gifford. Bierstadt Hill and Moran, however, came later and with the expansion of the country sought the greater scenery of the West, while F. E. Church not only painted the national wonder of Niagara, but ranged south to the Andes and north to the Arctic Circle, as well as abroad. These men and many others gave a view of romantic America which had long filled the public mind. George Inness, our greatest landscape painter, took a different view. With a much greater power of painting than his predecessors he sought to render the deep impressions made upon him by nature and to present the beauty of light and color which he everywhere perceived. In this view he has been followed by

AMERICAN LANDSCAPE PAINTING



1 Autumn Oaks. By George Inness

2 Conway Peak. By Thomas Cole

most of our later painters — the most noteworthy being Wyant, Tryon, Homer Martin, and, chiefly in marines, Winslow Homer. They have sought to render, not so much the striking forms of crag and torrent, as the myriad phases of sunlight and shadow, color and relations of form. In the last half century too the influence of foreign methods of painting is far more important than in earlier days. The earlier landscape painters picked up their painting largely by themselves or learned of each other; they often went abroad but generally when they had definitely formed their style and confided in their own way of doing things. In after years the growing cosmopolitan character of all art has led to all sorts of influences. George Inness arrived by himself at many of the ideas embodied in the work of the great French landscape school of the middle of the century. Many others however learned much directly of the Barbizon school, of Düsseldorf or Münich, or more recently of the revolutionary technique represented in the public mind by the work of Monet. The older landscape was apt to present the striking phases of nature much as they might be seen by anyone who cared for them, and in much the same way (though more skilfully) as they might be rendered by anyone who had a gift for painting. The later landscape gives much more distinctly the painter's especial way of seeing nature and it is expressed more definitely in the painter's way. One cannot enumerate all those worthy of mention: Alexander Harrison is best known for his marines, R. A. Blakelock for a personal romanticism, Walter Palmer largely for his feeling for snow effects. J. F. Murphy and Bruce Crane impress one mostly for their «tonal» quality. Theodore Robinson, Childe Hassam, John H. Twachtman are the best representatives of the influence of Monet. Edward W. Redfield, Elmer W. Schofield and Gardiner Symons have in common that they see nature with a largeness of view and a truth of rendering that is uncommon. There will be found among the painters of the present century even those who care for the wider aspects of nature that seemed so romantic to the America of earlier years.

Bibliography.— Isham, S., 'The History of American Painting' (1905); Caffin, Charles H., 'American Masters of Painting' (1902). For a view of American landscape as it appears to the general historian of art, consult Muther, R., 'History of Art.' For a view of the earlier landscape a little nearer its own point of view, consult Sheldon, G. W., 'American Painters' (1879); Benjamin, G. W., 'Art in America' (1880).

EDWARD EVERETT HALE,
Professor of English, Union College.

AMERICAN LEGION, The. A society incorporated in New York, 6 March 1915. Its object is to enroll all citizens of the United States who, by previous military or technical experience in the various occupations essential to the conduct of modern war, would be in a position to render special service and who would respond in case the government should at any time need their services. The information is carefully classified as to qualifications and localities by a thorough system of cross-indexing and is held at the disposal of the government, the latter having no records of the addresses and qualifications of its honorably discharged soldiers, sailors and marines, nor of men trained in the various industrial fields now connected with the science of war. The management of the legion is vested in an advisory membership of 300 representative citizens from all sections of the country and headed by a council, composed of not more than nine members. The legion creates no new means of national defense. It merely collects, co-ordinates and renders instantly available the necessary advance information regarding citizens already trained to arms and in other essential occupations, so that in case of war the work of the government will be greatly facilitated.

AMERICAN LEGISLATIVE ASSOCIATION. The American Association for Labor Legislation is organized to investigate conditions underlying labor legislation and to collect and disseminate information leading to the enactment and efficient enforcement of laws for the promotion of the comfort, health and safety of the employees. In 1910 the association called the first American Conference on Industrial Diseases, the second in 1912. In 1912 it called a meeting for the discussion of the prevention of industrial accidents, in 1913 it called the first Social Insurance Conference and in 1914 it called the first National Conference on unemployment.

AMERICAN LIBRARY ASSOCIATION. A national association «to promote the welfare of libraries in America.» It aims (1) by organization and force of numbers to effect needed reforms and improvements, most of which could not be brought about by individual effort; (2) by co-operation to lessen labor and expense of library administration; (3) by discussion and comparison to utilize the combined knowledge and experience of the profession in perfecting plans and methods, and in solving difficulties; and (4) by meetings and correspondence to promote acquaintance and *esprit de corps*. The association was organized in 1876 and incorporated in 1879. The present membership is about 3,300. Annual meetings are held. Executive offices in charge of a salaried secretary are maintained in Chicago in the Public Library building. This is the centre for the association's activities which may be roughly grouped as follows: (1) Editing and publishing the official *Bulletin*, issued bi-monthly, through which the membership is kept informed of the plans and work of the association and its committees. One number is entirely devoted to the 'Proceedings' of the annual meeting and another to the 'Handbook,' containing lists of officers, committees, members, etc. (2) Editing and publishing the 'A. L. A. Booklist,' a monthly guide to the selection and purchase of the best of the current books. (3) Publishing and sale of all publications of the association, some 250 publications on library economy and bibliography having been issued in the past 30 years. (4) Correspondence on all phases of library work, the executive office acting, so far as it is able, as a clearing house of library information. (5) Co-operation with the association committees, library commissions, State library associations and library clubs and other national educational

and civic associations. (6) Promoting better library architecture by collecting and loaning plans of library buildings. (7) Promoting general publicity of the aims and activities of the association and library work at large. Affiliated with the American Library Association are four national associations of kindred purpose: National Association of State Libraries, League of Library Commissions, American Association of Law Libraries and Special Libraries Association. The National Education Association has a library department closely connected though not officially affiliated with the American Library Association. Committees, standing and special, include those on bookbuying, bookbinding, public documents, library administration, library training, co-operation with other national associations, libraries in hospitals and charitable and penal institutions, work for the blind, international relations and Federal and State relations. Consult 'Papers and Proceedings of the American Library Association' (1876–date, published annually); Green, S. S., 'Public Library Movement in the United States' (1913).

AMERICAN LITERATURE. A hundred years ago and for half a century afterward, every assembly of students in this country was entertained by discussions on a "Possible Literature" of America,—how soon there would be an American literature was a favorite question, grief or complaint that there was not an American literature came in if the speaker or writer were of cynical vein. The introspection which was thus developed among people who were born for something better than introspection had its good results. Every printed word, one may say, was collected, which showed that between 1602 and the 19th century any man or woman had written anything in America. Such a collection as Samuel Kettell's 'Specimens of American Poetry' shows the eagerness with which critics who were forecasting a glorious future for our literature were willing to preserve all the crystals from the past and eager to persuade us that they were jewels. The truth seems to be that for the 17th and 18th centuries there was no class of men or women who would now be called "literary people." At the same time, the new settlers and the men and women of half a dozen generations which followed said what they had to say, and generally said it well. For they did not think much about the way of saying it, they did not talk much about it, they had no professional critics. There were among them those who "harked back" to English models. After the establishment of newspapers (see NEWSPAPERS), which runs back to the year 1704, the sad necessity of journalism compelled the press to create every week a given number of square inches of what is called "matter." Thus there appeared in the three cities a few of those writers who have to write as much when they have nothing to say as when they eagerly proclaim something not known to the world before.

It was not until 1555 that in the printed books of England the first fruits of the discovery of America appeared. Richard Eden then published his translation of Peter Martyr's 'Decades,' and he adds to them some new narratives of voyages not described in the original. An English translation of Ribaut's 'Florida' was printed in 1563. In 1576 the first edition of Sir Humphrey Gilbert's plea for a northwest passage appeared, and an account of Frobisher's voyages was published in 1578. In 1582 we touch solid ground as we come upon the name of Hakluyt. The island of Roanoke has the honor of furnishing the first original American work to English literature. The four letters of Ralph Lane, who was the first commander of Raleigh's first colony, are the oldest American writings now extant of any Englishman and were perhaps the first ever written. They were written 12 Aug. 1585 from what he calls Porte Ferdynando. One of them was to the famous Sir Philip Sidney. They were printed in 1860 for the first time in the 'Transactions of the American Antiquarian Society.' The English archives have now been thoroughly searched and have probably yielded up all that can be found in them of intercourse with America in this mythical century. There are two or three narratives of the adventures of sailors who straggled from Mexico, where the Spaniards had made them prisoners, to the fisheries of the northeast, where they were relieved by the fishermen. The earliest of these is dated in the year 1582. In the collections of Hakluyt and Purchas will be found other narratives of a similar character which struggled into print in one way or another. Professor Tyler in his admirable survey of the subject sees the first note of the birth of American literature in the ode of Michael Drayton, published in 1607, the year always assigned as the birthday of the nation, the year of the birth of Virginia, the year of John Smith and Powhatan and Pocahontas.

The history and criticism which belong to this subject have been admirably handled by the Messrs. Duyckinck, by Professor Tyler's 'History of American Literature from Colonial Times,' by Mr. Kettell, who has been named, and by Prof. Charles F. Richardson's 'American Literature' (1607–1885). It must be enough here to say that Capt. John Smith in his various accounts of Virginia and of his voyages on the coast created a real interest in that "brave new world which hath such people in it." Dr. Tyler refers also to George Percy, William Strachey, Alexander Whitaker, John Pory and George Sandys. The original editions of the publications of these men are now among the most interesting nuggets of the book collectors. The Hakluyt Society has republished many of them and has proved its value to the students of our early history. There is one interesting tract of Strachey's which would answer one pathetic question. He says, "Before I have done I will tell you the story of the lost colony." But in nothing that has been found of Strachey's is that history told.

That school of historians whose habit is to draw a blue pencil, as the trade says, across everything entertaining in history is fond of stamping John Smith as a liar wherever he goes outside Sandy Hook or Lincolnshire or the Strand. It is the fashion of to-day to throw the story of Pocahontas overboard and even Dr. Tyler, who is sympathetic, calls it the "fable of Pocahontas." But this is to be said, when 100 men trained like cockneys, embarked on an unknown sea, explored an unknown bay, tried

the adventure of an unknown river, talked in an unknown language with a savage chief who has never heard of such people before, the incidents of such acts when written by them will not be exactly like those of a London counting-room or of a college lecture-room. The Hungarian gentlemen, I believe, find Smith's account of Hungary and its Turkish wars intelligible and reliable. Smith's surveys of Massachusetts Bay are entirely intelligible and show an accurate acquaintance with the region which he describes. Now, it is hardly fair when you can verify an old author's personal narrative in nine cases out of ten, to say in the tenth case that he is a liar, simply because you have no material for verification, on the one hand, or contradiction on the other. Close after the little series of Virginian writers came the series of the Massachusetts historians. They also have been most carefully edited; and it is now only by a fortunate accident that a student of to-day is able to add any anecdote new to other students regarding the first generation of New England. The journal of William Bradford, one of the first governors of the Plymouth Colony, has a story which is dramatic. With a fortunate prescience of the value of every word which related to the Plymouth emigration, William Bradford wrote the 'History of Plymouth Plantation.' His sons and indeed all the people of the old colony knew of the exceeding worth of this volume. It was used by Morton, Prince and Hutchinson and the others of our earlier historians. A great part of it was copied and from the copy thus made it was consulted by our historians till the year 1855. In that year a quotation from it, which was not in our copies, appeared in Bishop Wilberforce's history of the English Church. On inquiry it proved that this gentleman had consulted the original which was in the library of the bishop of London in Fulham Palace. He immediately gave permission that the whole should be copied on the request of Mr. Charles Deane. Subsequently, as a result of the efforts of Senator Hoar, the various authorities in England gave back the precious manuscript to the State of Massachusetts, and it is now one of the treasures most sacredly preserved in the State House in Boston. As Dr. Tyler calls Drayton's ode the beginning of American literature, the Massachusetts people may well call William Bradford's chronicle the beginning of the literature of New England. It should not be forgotten, however, that the letters containing the accounts of Gosnold's unsuccessful colony in 1602 were written before the time when Bradford began to write his history.

When the larger colony of Massachusetts Bay was formed the general court of that colony, according to a very early record, directs that paper books shall be furnished for preserving all journals by the first settlers. Fortunately for their successors, Gov. John Winthrop in the midst of all his other cares used his manuscript books, and his notes made almost daily are now cited as Winthrop's 'History of New England.' They cover the period from 29 March 1630, when he sailed from England, to 11 Nov. 1648. It is a convenient aid to memory that Winthrop's death followed close on the execution of Charles the First. Sadly enough all the other blank books thus furnished seem to have served other purposes from that for which they were intended. They were, perhaps, used for sermons now forgotten, or possibly for cartridges so soon as cartridges were invented. Such materials for the early history as have been preserved have generally been printed by the care of historical societies or similar agencies. There is a charm about them such as belongs to all fresh narrative where the writers are thinking of the thing done and not of the methods of expressing it. This charm which hangs around Columbus' 'Letters'; Sir Thomas More's 'Utopia'; Defoe's 'Robinson Crusoe'; Swift's 'Gulliver's Travels,' is the same charm which is to be found in Purchas and Hakluyt and the early narratives of those who wrote by the light of a pine knot with pens made from a bird's wing. In such simple utterances we are to look for the first handiwork of American literature.

The first graduates of Harvard College made a class of nine young men, six of whom sought their fortunes in Europe. The year of their Commencement was 1642, and the theses are preserved in which, according to the custom of their time, they offered to defend 54 propositions against all comers. It has been observed by modern critics that all these propositions are now known to be false. This is a somewhat cynical statement with regard to them. But when one learns that these young gentlemen were prepared to prove that Hebrew is the mother of languages, one looks with caution upon their courageous statements on other points with regard to the heavens or the earth, the sea or the skies. Four of the number became clergymen. The name most distinguished in history is that of Sir George Downing, who did not distinguish himself for the courage of his convictions.

As early as 1639 the government of the colony had cared for its future education by the establishment at Cambridge of a printing plant. This was done almost simultaneously with the establishment of Harvard College by the same authority. And it was a good omen that the first publication accredited to the new printing house was the 'Freeman's Oath,' as ordered by the general court, to be taken by those who were chosen into the company. Universal suffrage was not yet dreamed of even by Sir Thomas More. The first book from the press which can be called a book was the 'Bay Psalm Book,' the work of Thomas Welde, John Eliot and Richard Mather.

John Eliot already looking forward to his work among the Indians was making his first studies of the language of the people for whom he cared. The modern students speak of this language as the Natick dialect of the Algonquin tongue. Eliot's work was of the first importance, and before he died the publications in that language alone of books printed either in our Cambridge or in London makes a department in literature of more than 30 volumes. These books were printed to be used in wigwams and log cabins. The copies which strayed into libraries were but few and those Indian books of that century which remain are among the rarest treasures of the collectors. Of Eliot's 'New Testament' in the first edition there are but 14 copies. Of the second revised edition, published more elegantly, there are 39 copies. The work that Eliot gave in translating the Bible into the Algonquin tongue has been

spoken of more than once as work thrown away. But to say this is absurd. Eliot proved himself to be one of the first philologists of any period of literature. His analysis of the Indian language is to this moment a guide to those who choose to study it. With the progress of discovery it has proved that the Algonquin language, of which the Massachusetts language was a dialect, was the language of more than half the Indians of our part of the continent. To this hour it is spoken by the Catawbas who are living in North Carolina, the Pamunkeys who are living in Virginia, by the Delawares who have been carried from Delaware Bay to Kansas, by the Micmacs, Penobscots and other Indians of Maine and of the northeast, and even by the Arapahoes in the west. Northward and westward it is spoken as far as the tribes of the great Ojibwa family, far beyond Lake Superior, and often near to the Arctic Ocean. Of 300,000 Indians, more or less, now in the territory of the United States, more than half would have been understood in conversation by Massasoit and Philip. An admirable bibliography of Algonquin literature has been prepared by James Constantine Pilling. It is published by the United States Bureau of Ethnology. The work of the devoted Moravian ministers in Pennsylvania in the same lines belongs rather to the next century.

Among the early settlers of Massachusetts was Anne Bradstreet, a girl of 18. She was the daughter of Thomas Dudley, who became the second governor of Massachusetts. She was the person called the "Tenth Muse" by Cotton Mather. Her poems, many of which were written before she came to America, are an interesting and curious memorial of the better educated colonists. She lived for most of her life at Andover in Middlesex County in Massachusetts Bay. The most diligent search in her poems shows hardly any reference to the outward aspect of the country in which she lived. Her flowers and her birds belong to the flora and fauna of England and not of Middlesex County. Between 1642 and 1700 Increase Mather and Cotton Mather are the names most often referred to as we look back on our literary history. Of Increase Mather we have in print 85 publications, mostly separate sermons. Of Cotton Mather the collection is much larger, the number of titles being 382. The modern fashion is to speak of the Mathers with a sneer as bigots and to dismiss them from the lofty consideration of our time. But whoever remembers the duties to which they had to put their hands is disposed to regard them more favorably. There was but little subdivision of work for the men who had been educated to be the leaders of their country. And certainly some allowance is to be made for ignorance of the laws of electricity when the teacher whom you are judging has to study his electricity as Cotton Mather did while he encourages soldiers for warfare, while he checks the smallpox by inoculation, while he is writing the history of the past and is caring for the poverty of to-day. any value to the world, he owed it to Cotton Mather's son, that if he himself had been of any value to the world, he owed it to Cotton Mather's 'Essays to do Good.' It is rather hard to throw Cotton Mather overboard either as a quack or a fanatic when such a man as Franklin was willing to write for him such an epitaph. It is fortunate for this generation that at a comparatively early period of his life Mather brought together in his 'Magnalia' historical papers which he had already written, some of which had been printed. The date of the first edition of the 'Magnalia' is 1702, but the work belongs almost entirely to the 17th century. Cotton Mather was himself born in the year 1663, so that a good deal of his record of the history of the first settlement is put on paper at second hand. Occasionally an unfortunate error here has puzzled his readers. For instance, before the discovery of the original Bradford manuscript, we owed to Mather the statement that the Pilgrim Fathers came from Ansterfield in the county of Yorkshire. This proved to be the misprint of the London printer for Austerfield. It was only on the discovery of this error by the late William Hunter that the American pilgrimages to Scrooby and Austerfield began. A good deal of injustice has been done Mather from what is in itself a comparative trifle, that his great book has not yet been edited by any competent editor. Even the detail that there is no decent index to it has greatly diminished its usefulness to historians in this generation. They ought to remember that he was but 39 years old when it was printed, and the corrections to his work which a man makes between 39 years of age and 60 nowhere appear in it. The reader is referred to the articles MATHER, INCREASE; MATHER, COTTON, and MATHER, SAMUEL, which in their place state what these men did for the growing colony during the period when it ceased to be a trading company and became really an independent State.

Thomas Hutchinson, a governor of Massachusetts, was a man of letters. And if he had not been the unfortunate governor whose disloyalty to the State gained for him the hatred of those around him, he would have been remembered with gratitude as such. He was an enthusiast about the history of the Pilgrims and of the fathers of Massachusetts. The first volume of his 'History of Massachusetts' was published in Boston in 1764, and the second volume in 1767. Alas, he was not equal to the duties of a great crisis, he deserted his countrymen, and by his country was branded as a traitor. But for this he would be named to-day as the first in the series of distinguished American historians.

The assiduous and successful attention which has been paid to the century of colonization has very naturally given to New England readers a better history of what passed in the 17th century than we have of the first half of the 18th century. During that time the people of the United States were involved in war with France. This meant for them a frontier war in which every savage was commissioned by French or Jesuit authorities to descend upon the borders of the English settlers. Excepting the stories of frontier warfare, there was not much to write history about. There are a few exceptions but in general the crown governors sent over by William and Mary, Queen Anne or by the first Georges were but a poor set. They initiated nothing and were well pleased if they could avoid a quarrel with the colonial assemblies. The one distinguished royal governor is William Shirley, who filled so well the duties almost unexpected of a commander-in-

chief of North America. So it happens that in reviewing the literature of the country we have no longer such unaffected and simple narrative. But we find ourselves more in the walks of religious speculation and of theology. In the front of the writers on such subjects is Jonathan Edwards, who challenged the attention of the learned in the English-speaking world by studies and results which have become famous. In the penury of frontier villages, and living day by day in what seems very petty surroundings, this distinguished man elaborated his studies on the divine counsels and placed his poor limits on the infinite in methods and language which will survive all other American literature of the first half of the century. It is inevitable perhaps that in the midst of such discussions of the idea there shall appear on the other side of the horizon discussions of the fact, or of those realities which men can see with the eyes and hear with their ears. And in our case, Benjamin Franklin was born into the world in the year 1706. Before he was a man he was well advanced in those studies of the English language which gave him afterward his power to express himself to men. Long before he was a statesman and diplomatist, he was conducting his experiments on electricity, and when he drew the lightning from the skies, he attracted the attention of all the learned world of his time. When we speak of the American authors of those 50 years the fame of Edwards and Franklin overshadows all the rest. With the discussions attendant on the American Revolution, a new school of authorship began. It now seems clear enough that the more thoughtful leaders of English opinion were from the very beginning amused, not to say delighted, with the simple dignity with which such men as the Adamses, Franklin, Dickinson and the great Virginia statesmen conducted the discussions, whether of matters of trade, of taxation or of government.

"History, my Lord," said Lord Chatham, in his famous address to the House of Lords, "has been my favorite study. . . . I must avow that in all my reading, and I have read Thucydides and have studied and admired the master states of the world, for solidity of reason, force of sagacity and wisdom of conclusion, no nation or body of men can stand in preference to the General Congress at Philadelphia. The histories of Greece and Rome give us nothing equal to it."

To this moment, indeed, no careful student of constitutional law or of the foundations of states can go forward in any intelligent inquiry without reading with care the work of the American statesmen of that time.

It is interesting to observe that at the same time, perhaps from the same cause, the theological literature of America becomes less and less interesting. The mind and heart and soul and strength of the educated men of America was steadily drifting into an interest in the present relations between God and man and the present sway of the eternal law, much more important to men and women, and among the rest, of men of letters, than theological explanations of the secrets of the universe. The student of to-day finds it worth while to read the publications of Thomas Mayhew, of Boston, of Dr. Witherspoon, of Princeton, of Dr. Samuel Johnson, of New York. But this is not because he cares so much for what is called theology in its narrow definition, but because these men enter as champions of the people into that larger theology of men who really believe that they themselves and all men may be partakers of the divine nature.

Franklin with his genuine instinct for "Together" did not live long in Philadelphia without bringing together one and another club of men of inquiring disposition. One of these clubs still exists in the American Philosophical Society. Another founded the fire department of Philadelphia. And, indeed, most of the activities which had given that city distinction, even before 1775, may be traced to such origins. Franklin's own newspaper, the *Evening Post*, may be spoken of as really a literary journal. *Poor Richard's Almanac* was not only an index of time and weather, but it was in its way a philosophical treatise. It was soon translated into French. Le Bonhomme Richard was known in French hamlets which knew nothing of the tea tax or the stamp tax. So soon as peace was declared such institutions as the American Academy of Arts and Sciences, as the Massachusetts Historical Society, as Tammany in New York, which was originally a scientific and philanthropic institution, came into being. The governors of the colleges took new courage; and commencements and the celebrations which accompanied them gave good occasions for such appeals or lamentations with regard to an American literature, or the want of it, as gave a healthy stimulus to the literary life of the new nation.

A curious illustration of the increasing confidence in home and the literature of home, as years went by, would be found in the series of college addresses of which the first were published at Cambridge in 1796. The Phi Beta Kappa Society, founded in 1776 at William and Mary College in Virginia, soon outgrew its first limitations; and its annual exercises at Cambridge and New Haven were attended by graduate members who liked to renew their college memories. Branches of it were founded in Brown College in Providence, in Dartmouth College in New Hampshire, and as years passed on, in other similar institutions. The early addresses by scholarly men in these societies were almost uniformly exhortation that the people of America might pay more attention to scholarship and literature. Meanwhile, and under such incentives, there grew up of course, in one centre or another, small coteries of literary men and literary women. With an amusing regard to tradition such men seemed to have felt that there could be no literature without an epic or two on which it should be built. Timothy Dwight's 'Conquest of Canaan,' Joel Barlow's 'Columbiad,' which are all but forgotten, and several others which are forgotten, were the results, almost of a sense of duty in this regard. No one can suppose that either of these men was inspired by any divine inflatus of the poet. As you read the dreary lines you feel that the writer thought that there must be an epic and that because there must be he would write it, with the same feeling that a column of soldiers storms a redoubt. By the side of such men, however, there came men and women who loved to clothe great thoughts with charming or fitting dress.

It is interesting to see that almost all of the

early books which we should now class as "efforts" in literature were published by subscription. And there is something pathetic in the memoirs of the earlier literary men where they describe their personal visits from place to place as they solicited subscriptions to pay for the printing of their books. President Dwight himself visited the camp of Washington in 1775 and obtained the subscription of Washington and the other distinguished men around him for the publication of the 'Conquest of Canaan.' The reader must remember that the practical introduction of stereotyping in England or America is as late as the beginning of the 19th century. It was necessary, therefore, to test the market in some way when a book was first printed, so that the printer or publisher or author might know how many copies should be printed. It must be remembered, also, that the printers had no capital which would enable them to keep in type the cumbrous pages of a book which passed the size of a pamphlet. Paine's 'Common Sense,' in 1776, was probably the first book which attained at once a circulation in the least approaching the large editions of to-day. The trade, as the book-selling community still likes to call itself, now begins putting out as a feeler a small edition printed from stereotypes. In our day in a vault in the side of a mountain, or perhaps in a vault under a sidewalk we preserve such plates from which a book has been printed, and according as the demand may prove, new editions can be issued at a comparatively small expense. But up to the year 1813 there was no such resource.

The pecuniary poverty of the printers of the end of the 18th and the beginning of the 19th century caused many American authors to go to England for the printing of their production. Barlow's 'Columbiad' was printed in England. Irving's books appeared first in London. Indeed, Irving's wide reputation may be said to have been English before it was American. And he spent much of his early life in Europe, perhaps from the feeling that for a man of letters Europe was a home while America was a wilderness. James Fenimore Cooper made Europe his home for many years, feeling apparently that he could not find society of his own kind in his own land. The same is true of other American writers as far down as the thirties of the 19th century. That was the worse for the infant literature of the nation. Writers watched painfully for the expressions of English criticism, and one line from a Grub street critic was sweeter to them and worth more than any words from their own countrymen. It is indeed impossible to overstate the effect which was eventually produced by the "American system," as it was called, in the discussions of tariff legislation which followed the short war with England. From the moment when the American printer could send out to the world books as well printed as the printers of England, one may trace new strength in American authorship. The International Copyright Law of 1891 compels the publishers of all books which claim American copyright to print them in America. In a truly celebrated article in the *Edinburgh Review* of 1820, of which no other line is remembered, Sydney Smith said: "Who reads an American book? Who looks upon an American picture?" The men who painted American pictures were very mad, as their vernacular would say; and the men and women who wrote American books were equally mad. The writers had a better chance to express their anger than the painters. The sneer implied was the more cutting because for most purposes of literature it was true. Possibly it had some share in the growth, almost from that moment, of a literature which can fairly be called American. The worst of it was, perhaps, that Sydney Smith was an advance guard of the Liberals of England. He could not be called the product of an "effete civilization," and his words could not be ascribed to Tory jealousy. American readers had known how to prize him and they read his articles if they did not read their own. But really an American author had little right to complain so long as Mr. Cooper called a woman a female simply because Walter Scott did, so long as our writers knew more of robin-red-breasts and bulfinches than they knew of bluejays or mocking birds, so long as their best actors came from England as every play upon their stage was English, and so long as their scholarly men read the *Edinburgh Review* and the *London Quarterly* and the *New Monthly Magazine* as they read no American journal. The American college boy knew much more of the loves and hates of literary men in England, one might almost say, than the English boy of the same time did. The English reviews and magazines passed from hand to hand in the American reading-rooms while their American rivals died a slow death due to the incompetency of most of the writers. But as the 19th century advanced the tide turned. Dr. Holmes in a happy phrase, quoted as often as Sydney Smith's which has been cited, fixes Emerson's first Phi Beta Kappa address as "our intellectual declaration of independence." I heard the address in 1837, and half a century afterward I heard his second Phi Beta address. Whoever will compare the two will see what Dr. Holmes means. To the thoughtful reader now it seems impossible that Emerson's first address should have seemed extravagant or in any way, indeed, out of the common to the men of that time. But it did seem so then.

It is true that ever since the century began such addresses on Commencement days or on other literary occasions have still given four-fifth of the time to pathetic appeals to young men to create an American literature. The orators, generally clergymen or lawyers, did not understand that such books as Lewis and Clark's journals were American literature, that Pitkin's statistics was a book of American literature, that Flint's 'Mississippi' or Pike's 'Adventures' were vigorous bits of proper national literature, that the Constitution of the United States or John Adams' proposals for the State Constitutions were American literature, as much as the Waverley Novels belong to Scotch literature, or Petrarch's 'Sonnets' to Italian literature. But by the middle of the 19th century, people had found out that literature is not a thing by itself to be worshipped and loved like some lonely classical statue in some separate shrine in a gallery, but that literature is simply the expression of what is. In the matter of American literature it proved that Americans had to state for the world the foundation principles of government. They had to describe

for the world physical features of a continent of which the larger world knew nothing. And even the language in which they spoke would bear marks of the climate, the soil and the history of that continent. So soon as we throw aside the follies of talking about literature as literature and of worshipping it as a separate idol, so soon American literature can be spoken of as a thing in any sort distinct from the literature of the feudal system or other literature of the ancient world.

To review in the very briefest way the literary advance of the nation from the era of independence we have to look first at the speeches and letters and pamphlets of the statesmen; and next at the reports of the explorers. There are individual poems and a few sporadic books in prose which linger in the remembrance of antiquaries — Philip Frenau's Revolution poems, one or two sermons, perhaps may be classed among such memorials. To speak in a broader sense the first work of Irving stands as the first work in the large calendar of our modern literature. His amusing studies of early New York were known then, but the 'Sketch Book' as it was published in London in the years between 1820 and 1822 at once obtained a wide reputation, both in London and in America. Irving showed from the first that he could handle American subjects with a pen as light and a fancy as charming as gave life to 'Bracebridge Hall' or his other English studies. In 1825, when Navarrete first published in Madrid the original documents of Columbus' voyage, Alexander H. Everett, who was then our minister in Spain, called Irving's attention to these invaluable memoirs and suggested his work on the life of Columbus. Irving went at once to Madrid and was attached to the American legation there while he studied the subject which is so closely identified with his name. And afterward, when the Spanish people received him as our minister there he enjoyed his well-deserved fame. Here was an American who could meet English writers on their own terms. Irving was master as well as they of whatever is meant by style or method in literature, whatever secret of the guild there is.

In our time there is no longer a patron who shall endow a book as an emperor might endow an opera house at his capital. For a time or a nation without patrons, you must have such patronage of the public in advance as Dr. Dwight sought for with his subscription book; or, as it has proved, in 150 years, you must have magazines. This means, if one speaks to the Philistines, that you cannot have large wholesale business, no, and you cannot have manufactures unless there be retail business. Dr. Johnson and Oliver Goldsmith had found this out when they worked for Cave and the *Gentleman's Magazine*. One and another adventurer tried the magazine experiment in Boston or Philadelphia or New York. But alas, the printers of the magazines were almost as poor as the authors were. The people of the country also were very poor in other affairs. As late as 1834 Dr. Holmes wrote for the *New England Magazine* the first papers of the 'Autocrat of the Breakfast Table.' But the *New England Magazine*, even with such contributors, died for want of readers. The new series of the Autocrat, in 1857, begins with the words, "As I was saying when you interrupted me," which referred to the death of the first series a quarter century before. Still, the names of those old magazines are interesting gravestones which show the roadway for a struggling national literature. The *Harvard Register* of 1807 is one of the earliest. The *Lyceum* follows the *Collegian, Harvardiana,* and now almost every university gives this excellent field for the tournament of squires and even of pages who look forward to golden spurs of knighthood. A few lines of the Harvard *Lyceum* of 1810 may be worth copying. They are from a clever parody of Barlow's 'Columbiad' and describe an early steamboat. They are among the boy amusements of Edward Everett.

So where high Hudson belts his hundred hills,
Winds his wide wave, and York's broad basin fills;
With engine force the fluid fields to plough,
The mighty Steam-boat points his sailless prow.
Knees from the winds no gales, the sea no tides,
Whirls the wheel oar, and o'er the river rides.
Lo with what art the nice machinery turns,
With what fierce force the pitchy pine pole burns.
See the black Boiler, in whose darksome womb,
The prison'd water vapours into fume:
The hollow Cylinder, whose shining side
Cramps the crook'd Chain, and turns the densing tide:
Etc., etc., etc.

Of those of the magazines proper which were manfully and loyally sustained for many years is the *Knickerbocker* which was published in New York monthly for several years. Most of the authors who won distinction in the literature of the century made their maiden contributions to its pages. In Boston a beginning, which proved to be a foundation, was made in the issue of the *Monthly Anthology*, of which the first number was printed in 1809. It was the work of a literary club, and it is very creditable to the literary life of the day. Some original translations from the minor poems of the great German poets slipped in. And by this time, America had found out the resources of the German colleges. George Bancroft, Frederick Hedge, Edward Everett, Henry F. Quitman, George Ticknor studied in the German colleges. The success of the *Anthology* and perhaps a certain jealousy of the literary tyranny of the *London Quarterly* and the *Edinburgh Review* led William Tudor, with the spirited young fellows who wrote for the *Anthology*, to announce the *North American Review* of which the first number was published in 1815. It may be said of the *North American Review* that a desire to imitate the English quarterlies weakened it for perhaps a quarter of a century. But its tone was always dignified and on really national questions it was American. In the earlier numbers of the *Review* it admitted poetry and some short articles which did not pretend to be criticism of books. The successive editors of the *Review* were William Tudor, Edward Tyrrel Channing, Edward Everett, Jared Sparks, John G. Palfrey, Francis Bowen, Andrew Preston Peabody, Alexander Everett, and James Russell Lowell. A few years after the Civil War it was removed from Boston to New York under the direction and charge of Allen Thorndike Rice. In Philadelphia what was called the *American Quarterly Review* was published under similar auspices.

Meanwhile what had attracted attention at once to a very great extent was the success of Cooper's novels. The later novels of Scott

were still engaging the attention of readers when Cooper's earlier stories were published. He had left Yale College without a degree, disgusted with something or other as youngsters are apt to be in colleges, and had joined the United States navy. This, as it proved, was fortunate for the literature of America. After the short war with England, he was stationed on Lake Ontario, which was at that time in the wilderness. At his father's home he had already made acquaintance with the wrecks of the Six Nation Indians. At Oswego he fell in somehow with the last of the Mohicans. His study of a real forest and his studies of the forecastle of American ships are both genuinely national, and although he could not resist the spell of the "great enchanter," and imitated Sir Walter Scott whenever he got a chance, the early Cooper novels have the great charm of being interesting. To this hour the school boy reads them as his grandfather read them and regards them among his best friends. In Cooper's later novels there may be seen a tinge of ill temper because he fancied that he had not been esteemed fairly by his own countrymen. But the early novels have established themselves in a well-assured place in the literature of his country. Few people remember them, but it is said that the German novels on American subjects by Sealsfield were the inducement for a time of the great German emigration which began as soon as these spirited books began to be printed. His German name was Karl Postel.

Meanwhile the leaders of the nation had found out that a republic stands or falls according to the education of its people. It is impossible to estimate the change produced by the early determination of the more civilized States to improve the education of every child born in their borders. At the beginning of the century you might say that there was nobody to buy books, even if angels or archangels had descended from heaven to write them. But even in the middle of the century an army of readers, men and women, had been created. It began to be evident that a good book in the English language had more readers in America than it had in England. It began to appear that the reputations of English writers depended quite as much upon the American readers as upon those of the British Islands. Scott, Byron, Wordsworth, Coleridge and Southey had more readers on this side of the ocean than on their own. The same was true later of Macaulay's 'History' and of other books of permanent value. Disraeli said as early as 1845 that America was the present posterity for the Englishman,— that an English author knew what posterity would think of him by learning what the American of to-day thought of him. The creation of such a body of readers led to the growth of a genuine American demand for what could be called an American literature. A school of history grew up first in which Irving had led the way in which the great historical addresses of Webster and the Everetts and other orators were an essential part. The subserviency to English critics diminished as more and more scholars came from France and Germany. It would be fair to say that Bancroft, Prescott and Motley, as historians, Emerson as a philosopher, Longfellow, Lowell, Holmes and Whittier as poets made a distinct American school after the year 1830 when Bancroft announced his plan for his history, or more definitely perhaps in 1833. So far as this was a New England school it was somewhat affected by the literature of the Continent of Europe. but this effect has been overstated. Emerson was not at all indebted to Germany in his work. Longfellow's poems are distinctly American when they are not translations. Lowell won his English reputation by the admirably national characteristics of the 'Biglow Papers.' Still a distinct ripple on the tide of literary advance may be found in all the seaboard States when in the twenties of the last century the Holy Alliance exiled from Germany Lieber, Follen, Beck and some other young students who had displeased Metternich.

What is familiarly called the Lyceum System introduced an element of value constantly increasing in the higher education. It ought to be remembered that the Lyceum introduced Ralph Waldo Emerson to the people of America in a much shorter time perhaps than any published writing would have done without its assistance. Where the trustees and faculties of colleges would have refused to invite Mr. Emerson to speak, the students of college societies would gladly send him an invitation. Once heard he was of course sure to be remembered. Not to speak of other lecturers who were instructing all the northern States, arousing curiosity as to subjects on which they hardly touched, Ralph Waldo Emerson when he took up the work of a prophet unlimited by the restrictions of the priesthood led the way in a revelation which has affected all the literature of his time, whether in America or in England. In the smaller New England circle, Margaret Fuller, afterward the Countess Ossoli, by "conversations" and published essays called the attention of many young people to the wider realms of thought and especially to the more modern movements of philosophy and literature.

With the existence of a sufficient body of readers large circulations became possible for magazines. The first which succeeded pecuniarily were those which told the most stories, and it was on the basis of story telling that the *Southern Literary Magazine, Graham's Magazine,* the *Godey's Ladies' Book* and the *Boston Miscellany of Literature and Fashion* came into being, and by their success with the public created the literary magazine of to-day. When a Boston publisher could say in 1841, "We sell 1,000 copies every month to the Lowell factory girls," the word was spoken which showed that a sufficient supply of readers is necessary in the creation of a literature, and will in its time bring into being a sufficient number of writers. The *Knickerbocker,* the *New England Magazine* and the *Port-Folio* had failed to enlist anything like the public support which waited on all decent magazine work after the public schools had created their army of readers. One and another ineffectual effort was made to turn away the current of the English magazines and to introduce an American circulation in its stead. It is interesting to see that the early numbers of *Harper* were written almost wholly by English writers and large editions of *Fraser's Magazine,* of the *Dublin University Magazine* and of *Blackwood* still made up the popular reading of the reading-rooms. But in 1857 the *Atlantic Monthly* was created with

such writers as Bancroft, Prescott, Motley, Holmes, Lowell and Longfellow among its very earliest contributors, and one may say, on its working staff. Lowell was an office editor of the *Atlantic*. *Putnam's Magazine,* in New York, sprang full armed into existence. It introduced itself by an article which awakened curiosity, and perhaps one may say national pride, on the question, "Have we a Bourbon among us?" From that day to this magazine literature has held an important part in the work of the better literary men of America.

The short story had been invented in England. The serial story, as Dickens and Thackeray had shown, gave admirable opportunities for feeling the public pulse. It is amusing today to read that the publishers of the *Anti-slavery Standard* doubted whether they should pay James Lowell $400 a year for his contributions to that journal, contributions among which are some of the best poems which he ever wrote. This is only one among the many illustrations which peep out from the books of biography as to what Dr. Johnson or Goldsmith would have called the patronage of the readers of magazines and their editors. The encouragement to authors was little but it was enough. In the year 1849–50 the people who read anti-slavery newspapers began to talk of the serial issues in which the story of 'Uncle Tom's Cabin' was going forward in a newspaper called *The National Era*. The Southern writers on the Civil War ascribe to that book the complete change in American politics and in the questions which led to the war which belongs to the middle of the century. In 1851 the story was published in book form and at once became known not simply in America but in England and in all the literature of the civilized world by means of translations. Its circulation in England, for instance, was the first circulation of a book on what was called popular prices. One edition of it appeared in a newspaper issue at the cost of one penny a copy. Mrs. Stowe's supremacy as a writer of fiction established itself at once, and from that moment to this American literature can make the boast that it has furnished the book of which more copies have been printed than any other book which originated in the English language. It is a little curious that its only possible rival, if one considers simply the number of copies printed, is 'Robinson Crusoe.' Mrs. Stowe's story is that of a fugitive slave; Defoe's story is that of a shipwrecked slave trader.

After the Civil War the men and women of America learned that for the criticism or for the education which belonged to this nation, they must study their own country. In truth the society of America is American society, the laws of America are American laws. Its prospects and hopes are those of a democracy. As the strata of its rocks and the growth of its trees are different from those of England, so are the foundations of the state and the customs of its administration. It is impossible here to consider in the least detail the methods of different writers who have won the love and admiration of their countrymen in the years which have followed.

The central observation is that as soon as America furnished readers enough a proper American literature followed the demand. As soon as the system of the country made possible first-rate printing offices in rivalry with the best printing houses in England, the American demand for American books could be answered at home. In naming Cooper and Irving we have named the two writers distinctly American whose published work was first everywhere known. Other authors printed their books which were forgotten. There was perhaps something ludicrous in the effort to create aboriginal enthusiasms which did not exist. For instance, any early copy of the *North American Review* will show the standing advertisement on the cover that the publishers had a "supply of the 'Yamoyden' kept constantly on hand." The 'Yamoyden' was a poem on a supposed hero or heroine of Algonquin origin named the "Yamoyden." But the publishers spoke of the volume as a commission house might speak of so many bushels of wheat or barley. Books or essays of purely American type struggled into existence and some of them are still remembered. Edgar Allan Poe was born in the year 1809 and died in the year 1849. Warren Burton's 'District School,' Mrs. Gilman's 'New England Housekeeper,' some of James K. Paulding's sketches and essays were distinctly American. Mrs. Sedgwick and Miss Sedgwick wrote admirable and unaffected books. Edward Everett and Alexander H. Everett with all the advantages of early European training were thoroughly American in their orations and in the work which they did in the *North American Review*. That publication itself while it imitated aspects of the English quarterlies always carried an American chip on the shoulder and defied all foreign travelers or foreign critics who did not find perfection in everything American. A story of pure American life, most instructive to the student of that older time, is Sylvester Judd's story of 'Margaret, a Tale of the Real and Ideal, Blight and Bloom.' Judd was a poet, but this prose novel has proved his best work.

The exquisite genius of Nathaniel Hawthorne would have worked its way through any difficulties. In his own nation his favorite earlier subjects, drawn so largely from the traditions of the early centuries, undoubtedly had their share in introducing him to the great body of readers. So soon as he traveled abroad, he showed that he could handle any traditions and was at home in any atmosphere. As in all work of men of genius his temperament and, as he says, the traditions of his life, governed to a certain extent his choice of subject. But always it is Hawthorne who is the master and fascinates the reader; and there is no other Hawthorne. In other instances perhaps a certain charm is given in English circles to the naivete of what one may call the frontier habit of the American writer. Walt Whitman had an affection of expressing a disgust, which he did not really feel, with all the conventionalities and institutions which did not smell of the pine knot or of kerosine. He is said to be better known in England than in America. This is somewhat as it has happened with an American preacher like Moody and others who could be named, who has won attention even by the accent of his voice. After he had won attention abroad he needed nothing more. We may say again that

this is no place to enter into an analysis or other discussion of the work of different American authors and of their hold upon the national life. When one remembers that no prose writer of our country is more likely to be generally read three centuries hence than the despatches of Ulysses Simpson Grant, he hesitates before he shall say who are the literary men. Give time enough and Washington becomes a literary man, and Judge Marshall. But this may be said, that of the heroes in the New York Hall of Fame, Thomas Jefferson, James Kent, Joseph Story, Asa Gray, Jonathan Edwards, William Ellery Channing, Horace Mann, Henry Ward Beecher, Ralph Waldo Emerson, Nathaniel Hawthorne, Henry Wadsworth Longfellow and Washington Irving, would not have been named among the most distinguished Americans except for their work with the pen. Franklin might be numbered as a naturalist, Washington or Grant as soldiers; but the 12 who have been named won their place simply as authors. And every one who is in any way familiar with their work understands that this work is distinctly American. You could not mistake it. If you read 25 pages from any of these authors, you would know that he was brought up under the institutions of a republic and that the width of horizon, may one say, comes in as a part of the atmosphere to which in the omnipotence of God the American is accustomed. In naming those to whom the country owes the growth of its literary taste, the charm of great travelers and great historians should be added to the great statesmen. But the list as far as it goes is not useless, for it shows what is the current of average feeling of the people of America The people of America is sovereign of America and as everywhere the sovereign is the fountain of honor. We could choose no better instance of the encouragement given by the people to the author of first-rate genius and ability than is found in the literary career of John Fiske. Fiske owed none of his success to official position. No distinguished review called attention to the way a young man needed encouragement, but simply Fiske had a great deal to say and he said it. And by the time he said it there was a nation of people who had been educated to appreciate and enjoy what he said. He used to say that even in his young life he was looking forward to history as the study which he was to pursue through his life. The opportunity came for the gratification of this passion. He seized upon the opportunity, and the American people recognized the hand of a master. But Fiske was not to be shut up within any narrow range of study or of authorship. He had his own views of life and duty, of ethics and of destiny, and he wrote them down. He said what he wanted to say in a form which won the sympathy of all thoughtful people, and there were enough readers trained to careful thought to welcome the gifts which in such service he made to the nation. Perhaps in speaking of this instance we are speaking simply of the step forward which the conscience and heart of the whole nation made in obedience to the word of Ralph Waldo Emerson, who gained a welcome in all quarters,— in the miner's cabin or in the sanctum of kiln-dried seminaries. It has been said that of the early volumes of Emerson's 'Essays' millions of copies might be found to-day in the hands of the most ignorant or the most learned men, and millions of men who never heard his name are living under the inspiration of his prophecies. It is said by the English critics that Longfellow's poems are better known by the people of England than are Lord Tennyson's. Perhaps this is true.

It has also been curiously true that more than one English reputation has been first made in America. Carlyle's first books were well known here before the critics of England honored them with their approval. The English writers whined a good deal so long as they had no protection at American law for their copyrights. This nation was creating a reading class at an expense such as monarchs never dreamed of, such as England has never thought of, and it was the fashion to chide Americans because at the outset they did not throw open the market thus created to the writers of a nation where there was not one reader for a hundred in America. The International Copyright Act has remedied this grievance. But it has not proved that either the English or American author has gained readers by any of the accidents of publication. The rule holds which Abraham Lincoln laid down so well that the people who like that sort of thing will read that sort of thing. But so far as statistics of the trade in books go, it is evident that the rank and file of American readers are interested in American subjects treated by writers who feel the American impulse and were early baptized in the ways of democracy. For the work of individual writers see the following article and the separate biographies in this Encyclopedia.

EDWARD EVERETT HALE.

AMERICAN LITERATURE, Synopsis of. The first great American poem was 'Thanatopsis' by William Cullen Bryant (1794–1878). There had been rough ballads and songs on the one hand, and literary odes and epics — by John Trumbull (1750–1831), Timothy Dwight (1752–1817), Joel Barlow (1755–1812), and others — while there were snatches of real poetry in the work of Philip Freneau (1752–1832). But the first American poet to make a deep impression on people abroad as well as at home was Bryant. With all his interest in the picturesque and romantic in all ages and in all countries, he was generally most himself in his pictures of American life and in his expression of American conditions. Besides Bryant, and about his time were a number of other men of letters in New York whose poetry pleased their time, but who are remembered now by the tradition of perhaps a single poem. Such are John Howard Payne (1792–1852) the author of 'Home, Sweet Home' whose real work in life was in the drama, Samuel Woodworth (1785–1842) the author of 'Old Oaken Bucket' and George P. Morris (1802–64), whose 'Woodsman, Spare that Tree' is remembered if not often read. James Rodman Drake (1795–1820) and Fitz-Green Halleck (1790–1867) wrote together and separately poems which delighted their contemporaries. At the same time appeared the poetry of Edgar Allan Poe (1809–49). Poe wrote all sorts of things — poetry, stories,

critical and other articles — for the magazines, some good and some bad, often under the spur of necessity. But among his poems may be found a few which have that peculiar and individual lyric quality that belongs especially to the poet, and not to any particular nation or time. With less pure poetic genius, perhaps, but more sense of the beauty and romance that charms people, and more of an easy gift of verse, Henry Wadsworth Longfellow (1807–82) began his long career with renderings of the poetry of other peoples. He was a college professor, widely read in the literatures of other nations, and his earliest poetry not unnaturally was the rendering of what had charmed and interested him in his reading. But he, as well as the rest, was impressed by the romance of American life; indeed, his very first poem is on a subject from American history. And in 'Evangeline,' 'Hiawatha,' the 'Courtship of Miles Standish' as well as in many shorter pieces he fixed in beautiful forms, figures and legends from the American past. American though he was Longfellow saw American life largely through the glasses of traditional literature. A more direct impression of American, or more exactly of New England life, was that of John Greenleaf Whittier (1807–92). Though he knew English literature well yet his poetry does much to give a true idea of New England country life as it appears to a real country nature of a most delicate and refined type. Nearer still, however, to the ordinary average American life (or at least aiming to be) was Walt Whitman (1819–92), who used every effort to give his work the character of free uncontrolled democracy. His poetry is of a wholly unconventional form and his view of life is equally direct, free and unrestrained. To many readers, especially abroad, he is the most representative American possible. James Russell Lowell (1819–91) is better remembered as an essayist, a scholar and a critic than as a poet, yet his 'Biglow Papers' have not only the qualities of the best poetry but a naturally homely character that is as rare of its kind as anything in literature. Oliver Wendell Holmes (1809–94) was best known in his especial field of light and humorous verse, in which vein he had few equals and no superior, although he also wrote essays and fiction. Other New England poets of those years should be noted, although their works have not survived: Mrs. Lydia H. Sigourney (1791–1865), James Gates Percival (1795–1856), Jones Very (1813–80), Samuel Longfellow (1819–92) are but a few of the many gifted and cultivated spirits of that generation of New Englanders. There were fewer poets in the rest of the country, but Bayard Taylor (1825–78), who wrote much beside poetry, and John G. Saxe (1816–87), should be mentioned, while Henry Timrod (1829–67) and Paul Hamilton Hayne (1830–86) wrote much that showed poetic feeling and appreciation of the beauty of nature, although it appears to have lacked the preservative quality of true genius.

Poetry has been mentioned first in this sketch because it came first to general public notice, but the first great American man of letters to be recognized as such at home and abroad was Washington Irving (1783–1859), who wrote almost everything except poetry. He had to a marked degree the essayist's gift of sympathetic and humorous observation joined to a power of easy expression which had been refined by an affectionate study of the English masters. He had not only a delight in the romance of Europe but a pleasure in things American, and he pleased not only America but Europe by his appreciation of both. He wrote fiction and history as well as what would be more definitely called essays, but whatever he wrote was delightful to his own day because of the quality that he was able to give it. As the New Englanders of his day tended to poetry so the New Yorkers, or the "Knickerbocker School" as it was called after Irving's famous fiction, are best remembered by their essays. James Kirke Paulding (1778–1860), Gulian C. Verplanck (1786–1870), N. P. Willis (1806–67) are more properly to be called men of letters than anything else though they wrote stories and poems. Three who came a little after them are more noteworthy: Donald G. Mitchell (1822–1908), who under the name of "Ik Marvell" wrote the 'Reveries of a Bachelor,' George William Curtis (1824–1900), who although he wrote and did much else for which he became justly distinguished, never surpassed the charm of his early meditations on 'Prue and I,' and Charles Dudley Warner (1829–1900) whose homely and somewhat humorous books of reflection and travel were a good deal read. It is not right to speak of Ralph Waldo Emerson (1803–82) specifically as a great essayist nor can he be mentioned especially as a great poet or a great philosopher. Philosophy he of course had, and poetry, and he expressed himself in lectures that easily took the form of essays. But his true position is something outside of philosophy or literature; he has been an immense spiritual influence; in America touching alike the cultivated and those with hardly a touch of education, influencing those deeply read in the philosophies of the world and those whose experience came from daily life alone. He himself once said that he was the voice of New England speaking as it had to speak, by which he meant that he expressed the higher ideals of American life. Whether we think of him as man of letters or philosopher, as essayist or critic, we shall have to recognize that no other American has been so active a factor in arousing and stimulating the higher life of the people. One especial form of his influence is especially characteristic of American literature, that which has colored the view of certain writers on nature. These gained a great inspiration from Emerson which they strengthened by keen power of observation. Of these the chief is Henry David Thoreau (1817–62) a man of great originality, but more of a philosopher than naturalist. John Burroughs (1837–) is more of an observer and a naturalist, but of an equally suggestive and vital spirit. John Muir (1838–1914) may also be mentioned here though much of his work appears to have been merely private record for his own satisfaction. It may stretch the ordinary idea of literature to include the name of John James Audubon (1780–1851). His chief work was with the pencil, but his journals are full of his own brilliant and poetic personality, and also, it should be added, give a view

of America and its people and its natural resources that can be gained in no other way.

There had always been American historians, unless we draw our definition of history very closely, from the days of John Smith (1579–1631) and John Winthrop (1588–1649). In the first half of the 19th century, history still lacked some of the limits that have grown about it and was as often found in the historical orations of Daniel Webster (1782–1852), of Edward Everett (1794–1865), or in the picturesque narratives of Washington Irving as in the more regularly historical work of Jeremy Belknap (1744–98) or Jared Sparks (1789–1866) or the other scholarly students of history or biography. With George Bancroft (1800–91), however, a more definite historical tradition began, to be distinguished by an equal and devoted care for original sources and literary style. William H. Prescott (1796–1859), John Lothrop Motley (1814–77) and Francis Parkman (1823–93), form a very remarkable group of historians. The great orators of our earlier days were chiefly statesmen,—the names of Daniel Webster (1782–1852), Henry Clay (1777–1852), John C. Calhoun (1794–1856) and Edward Everett (1794–1865) coming at once to mind, although the last named was noted also in other forms of public life. Among the great orators of a later generation, however, the most distinguished have, as a rule, not been in political life; Wendell Phillips (1811–84), Henry Ward Beecher (1813–84) and Phillips Brooks (1835–93) will probably be better remembered as orators than Charles Sumner (1811–78), Stephen A. Douglas (1813–61) or Chauncey M. Depew (1834–). It is in this place that we should mention the great name of Abraham Lincoln (1809–65). No part of the energy of his remarkable mind and character was ever given to the production of anything that he conceived as literature. Yet his powers of thought were so intensely right, his power of expression had been so nourished by the best English written, and both were used with so single an eye to the real needs of the occasion and so certain an understanding of what the need demanded, that what he said or wrote had a quality that could not be gained by literary care. His "Gettysburg Address," therefore, not only makes an immense impression even now, but it was influential in changing the style of oratory of the nation. We ought to mention a number of writers as characteristically American as any other writers. From an early day there had been those who presented a humorous view of the situation in a peculiarly quaint manner. The names of Jack Downing (1811–52) and the Widow Bedott (1792–1852), even of Artemas Ward (1834–67) and Josh Billings (1818–85) are now all that will be remembered of their voluminous works. But the work of Samuel Clemens (1835–1910) known throughout the world as "Mark Twain" had some of more enduring qualities which make real literature as well as the humoorus qualities that endeared him to people in general. Later writers whose gift is chiefly that of humorous interpretation of life are Peter F. Dunne (1867, widely known as "Mr. Dooley"), and George Ade (1866–).

The most striking thing in American fiction has been its presentation of American life. Even the stories of Brockden Brown (1771–1810), our first novel writer of real ability, beside the extravagant horrors and mysteries of their time, have a certain actuality that make them still worth reading. Of the stories of Irving, Paulding and others the best are generally those which present the old Dutch life of the Hudson River. James Fenimore Cooper (1789–1851) was and is still best known for his stories and characters of the American wilderness. John P. Kennedy (1795–1870) and W. G. Simms (1806–70) are still interesting for their pictures of Southern life. It is one of the remarkable things about Poe that his work has little of the particular character of his country; his best stories of horror or mystery are still well known, especially those in which he anticipated the detective story of the present day. Fitz James O'Brien (1828–62) wrote some excellent stories in which an idea of fantastic imagination is presented in very realistic form. Such too are the stories of Edward E. Hale (1822–1909) whose 'Man Without a Country' gained belief by its realism and appealed to all by its imaginative passion.

There were many romantic story-writers (and some not especially national) in the generation before the war of whom the best remembered are J. H. Neal (1793–1876), Herman Melville (1819–91), Theodore Winthrop (1828–61) and Harriet Prescott (1835–). Harriet Beecher Stowe's (1811–96) 'Uncle Tom's Cabin' belongs even more to history than to literature, but this book as well as 'Old Town Folks' owes its interest to being a close picture of life. Something of this strain will be found in Nathaniel Hawthorne (1804–64). His earlier tales of realistic observation as well as of poetic imagination, of historic life and character as well as of delightful fancy, were not at once popular, but his great novels, though by no means realistic, are thoroughly American. In the years after the war came the slow growth of the fiction that was consciously realistic, both in short story and novel, of that fiction which takes for its subject the everyday life around us and finds its chief interest in the study of character and the observation of life. Here were William Dean Howells (1837–) and Henry James (1843–1916), who began to write stories about this time, and who came to general acceptance as our representative novelists 15 or 20 years later. Each was a master of the short story as well as the novel and each wrote also for the stage and for criticism. James took for his chief subject the American abroad, while Howells found his chief interest in the great mass of average Americans in their own country. Their example led others to turn their attention more particularly to an especial study of American life as it developed particularly in particular places. By 1880 the novel especially devoted to local color was a definite form. Sarah Orne Jewett (1849–1909) and Rose Terry Cooke (1827–92) in New England, and Edward Eggleston (1837–1902), Mark Twain (1835–1910) and Bret Harte (1839–1902) in the great Central States, the Southwest, and the Far West, were noteworthy names out of many. At this time George W. Cable's (1844–) 'The Grandissimes' and other stories of Creole life in the South, and Miss Mary N. Murfree's (1850–) stories of the Tennessee Mountains, published

under the name of Charles Egbert Craddock, aroused the attention and interest of writers and readers alike. Mary Wilkins wrote of New England, Harold Frederic (1856–98) of life in the Mohawk Valley, F. H. Smith (1838–1915) of New York city, T. N. Page (1853–), J. C. Harris (1845–1909), James Lane Allen (1849–) of the South, Owen Wister (1860–) in 'The Virginian' of the Far West, Alice French (1850–) (as "Octave Thanet") and Hamlin Garland (1860–) of the Middle West. F. Marion Crawford (1854–1909) was one of the few who at this time held to what would be called the romantic ideal, but he remained popular through waves of realism. Frank Stockton (1834–1902) also stood on one side of the general movement by his remarkable gift of whimsical invention and delightful humor. In the nineties arose a delight in stories of American history. F. J. Stimson (1855–) was one of the first to revive an old form, but he was immediately followed by P. L. Ford (1865–1902), Weir Mitchell (1829–1914), Winston Churchill (1871–), Mary Johnston (1870–) and many others of ability. The end of the century was a noteworthy seedtime for fiction; all sorts of new paths were struck out; novels of adventure, Rex Beach (1877–), or of mystery, Anna Katherine Greene (1846–) became popular; novels of the great transactions of commerce, H. K. Webster (1875–), of the great outdoors, S. E. White (1873–), of all sorts of exotic life, of anything which would arouse and stimulate the imagination. The best representative of this kind of fiction was Jack London (1876–1916), who to a love of wild adventure joined an active spirit of social reform; O. Henry (1862–1910), whose stories rise from the emotions and feelings to be found in unexpected corners of the life of our great cities, is another characteristic writer. Among all these insistent passions for wide horizons and stimulating motives the representative of the careful study of actual life as we see it all about us is Mrs. Edith Wharton (1862–). Such, too, is the work of the chief novelists of the present moment with the addition often of some study or interest in current social problems. The work of Willa S. Cather (1875–), Dorothy Canfield (1879–), Ellen Glasgow (1874–), Henry S. Harrison (1880–), Robert Herrick (1868–), Mary Watts (1868–), Theodore Dreiser (1871–), which is the best fiction of the last few years, is the general sort.

In the poetry of the generation immediately after the Civil War we have a group of poets of less ability than the earlier New Englanders. Edmund Clarence Stedman (1833–1908), Thomas Bailey Aldrich (1836–1907), R. H. Stoddard (1827–1907), and later Richard Watson Gilder (1844–1909), were poets of a commercial society growing in a material way beyond people's belief of conception. Such a world allows a man to pause for a while at a fine thought or a fine deed, but rarely gives the leisure and experience so generally necessary for the development and experience of genius. Bret Harte should also be mentioned for his earlier poetry, though his reputation rests chiefly on his stories of California in the days of the goldminers. Two other western poets were Joaquin Miller (1841–1913), whose 'Songs of the Sierras' gave him a great reputation, and Edward Rowland Sill (1841–87), who, though he lived in California had the refined literary expression of older civilizations. Sidney Lanier (1842–81) was a Southerner and some of his most beautiful poetry is inspired by Southern scenes. In later years the most noteworthy poets were James Whitcomb Riley (1853–1915) with poems full of Hoosier life, Eugene Field (1850–95), whose best poems are inspired curiously enough by literature or by children, William Vaughan Moody (1869–1910), a man more of broad and general poetic character than any of his time, and George Cabot Lodge (1873–1910), who died before his truly poetic insight had developed to its full power. The last 10 years have seen a greater interest in poetry both by reader and writer than has existed for half a century. Of the number who must still be called minor poets two are the most noteworthy: Edgar Arlington Robinson (1869–), whose great insight is for character and satire and for a close reality of language, and Edgar Lee Masters (1869–), whose 'Spoon River Anthology' by its poetic realism has gained a wider audience than any other recent poetry. The others are generally noteworthy for an effort at breadth of experience and freedom in poetic form. Of the latter the best known names are Vachel Lindsey (1879–), Edwin Markham (1852–), Amy Lowell (1874–), Robert Frost (1875–), Ezra Pound (1885–), James Oppenhein (1882–), Louis Untermyer (1885–) and Harriet Monroe (1860–). Of those who more commonly keep to the older, more traditional forms the chief are G. E. Woodberry (1885–), Percy Mackaye (1875–), Herman Hagedorn (1882–), Fanny S. Davis, Witter Bynner (1881–) and Sarah Teasdale (1884–).

EDWARD EVERETT HALE,
Professor of English, Union College.

AMERICAN LOYALISTS. The American colonies were all infested with internal enemies during the Revolution. This hostile element, while averse to the oppressive measures of the British government, was still more averse to independence. Its guiding principle was loyalty to the Crown: hence the name "Loyalists," which has found general acceptance among historians of the present day.

In the New England States the Loyalist party was relatively weak, and its numbers were considerably lessened by the flights of many of its zealous and persecuted members in the early days of the war. The proximity of the Canadian posts north of Lake Champlain and along the Saint Lawrence, which were used for military purposes by the English at the beginning of the Revolution, enabled numbers of fugitive Loyalists to find protection and volunteer for service in "provincial" regiments. These regiments were gradually filled by sending recruiting officers into the enemy's country, and were employed on marauding and rescue expeditions. No less than 10 corps, several of which reached a maximum of 500 or 600 men, were thus maintained in the Canadian Division during the Revolution. While a proportion of these refugees came from the New England States, many others had found their way from northern New York. Often they were followed by their wives and children, who were brought in by the recruiting agents, or were conveyed

under flags of truce over the waters of Lake Champlain. Burgoyne's expedition in 1777 was joined by hundreds of Loyalists, who sooner or later escaped into Canada. In 1780 Sir John Johnson delivered 150 from the Mohawk Valley, and a little later Majors Carleton and Houghton brought in scores of families from south of Lake George.

From Maine, New Hampshire and Massachusetts other Loyalists early began to sail for Nova Scotia and for England. This movement overseas was given a marked impetus by the battle of Lexington. In July 1775, Judge Curwen of Salem, Mass., arrived in London, where he found "an army of New Englanders" already there, "lamenting their own and their country's unhappy fate." And yet, at the end of January 1776, over 2,000 adherents of the Crown remained with the British army in Boston, nearly one-fourth of whom were refugees "from the country." About 1,100 of these sailed for Halifax at the evacuation in the following March, including doubtless several Tory regiments raised in Boston under Howe's orders.

When the British army left Halifax for Staten Island in June 1776, it was accompanied by many of the refugees from Boston and by two companies of the New York Volunteers but recently sent to the Nova Scotian capital. The arrival of Dunmore's fleet a month later brought in another large accession of Loyalists, together with many negroes, this time from Norfolk, Va. From this time on to the end of the Revolution New York city and the neighboring islands received increasing numbers of fugitives from all the other colonies, as well as the region south of Albany. The pervading loyalism of the province, of western Connecticut and of New Jersey made possible the formation of not less than 20 corps of Loyalists in and about New York during the years 1776 to 1781, inclusive. These corps ranged in numbers from 29 to 1,100 men, and probably totaled 15,000. The loyal militia of New York numbered 8,500 more. After General Howe gained possession of Long Island in August 1776, hundreds of Loyalists from both Connecticut and Rhode Island found refuge there, forming a settlement on Eaton's Neck and perhaps at other places.

The occupation of Newport, R. I., by a part of the King's forces in December, called out loyalist addresses from the Quakers of that province, and from many of the inhabitants of Newport, Portsmouth, Middletown and Jamestown. In June 1778, two provincial regiments arrived at Newport from Kingsbridge, N. Y., and soon a body of 112 loyal New Englanders was enlisted, while small groups of Tories from Freetown and elsewhere came in for protection. When the British and provincial troops evacuated Rhode Island in October 1779, about 40 families departed with them, leaving other Tories behind. Those departing were posted in Saint George's Manor on the south side of Long Island, but most of them were taken prisoners soon after by a party of revolutionists.

The movement of Howe and his army to Philadelphia in 1777 caused the local patriots to flee from that city, thus turning it into a Loyalist centre to which numerous Tories resorted from the surrounding region. It also stimulated the formation of six Loyalist regiments in southeastern Pennsylvania and one in southern New Jersey, beside enlistments in other provincial corps which had accompanied Howe. Clinton, the successor of Howe, assumed command in Philadelphia in May 1778, and promptly decided to evacuate the place. With his troops marched the Loyalist regiments of the neighborhood, and over 3,000 other adherents of the Crown boarded the British fleet in the Delaware to be transported to New York.

The seat of war now shifted to the South. In November 1778, Colonel Campbell sailed from Sandy Hook for Savannah with a force including four Loyalist regiments. As a large part of the people of Georgia was friendly to the British cause many men joined Campbell's standard after his capture of the post at Savannah. Sunbury was taken with the aid of 400 Carolina King's Rangers under Col. Thomas Browne, as was also Augusta, Colonel Boyd and 800 Loyalists of South Carolina cooperating. Thirty miles above Augusta 300 Tories under Col. Daniel McGirth were active. The posts established in western Georgia were garrisoned by Loyalists, and there was scarcely a skirmish or battle that was not participated in by Loyalist troops. The burden of the defense of Savannah against the Americans and French in September 1779, fell chiefly on the Tory contingent, including the Georgia militia, but part of this Tory force consisted of men from New York and New Jersey, and part of those from the Carolinas. Tarleton's British Legion (over 1,000 men), Ferguson's Corps (140 men), and the New York Volunteers (350 men) helped to take Charleston, S. C., in May 1780. Only two Loyalist regiments seem to have been organized in Georgia. Some Tories fled from this province early in the war.

In contrast with Georgia the Carolinas furnished nine corps of Loyalists, several being of good size. Most of the nine were embodied under the orders of Cornwallis, who had succeeded to the command of the British forces in the South. The outlying posts in South Carolina were principally garrisoned by these troops, which had many encounters with the patriots, and at Camden in August 1780, outnumbered the British regulars by several hundred and played an important part in defeating Gates, "the hero of Saratoga." A few days later Tarleton with the British Legion and the corps of Light Infantry destroyed the last organized patriot force in South Carolina. Preliminary to his advance into North Carolina, Cornwallis sent messengers thither to rouse the "friends of government," and despatched Ferguson with 1,200 men, five-sixths of whom were Loyalists, to the western border of the province to gather recruits and harass the Americans. But Ferguson's operations also brought out a force of sturdy pioneers that turned the tide of war against the British at King's Mountain. Much the same story was repeated at the Cowpens in January 1781, where Tarleton was defeated. With Cornwallis near the Virginia border, Greene and the Americans swept the Loyalists from every stronghold in South Carolina. Thus, only Charleston was left to serve as an asylum for the hunted Tories of the province.

Meantime, General Arnold had been attempting to make a diversion in Virginia with an English force, including the American Legion

and the Queen's Rangers, two Loyalist regiments from New York. These and other such troops were used in carrying on raids into the interior, but without gaining many recruits. The irreconcilable royalists among the Virginians had left the country for England, New York and elsewhere during 1775 and 1776. The recovery of the lower States by the British, and the Tory and Indian raids from Detroit in 1779 and 1780, served, however, to revive loyalism in western Virginia, western Pennsylvania and in Maryland. Certain Tory leaders of the frontier claimed to have raised 1,300 Maryland Royal Retaliators up to June 1781, but nothing was accomplished because several of the promoters of this force were arrested and executed. Col. John Connolly, who was in command of the Loyalists of Virginia and North Carolina on the peninsula between the James River and Chesapeake Bay, had been counted on to co-operate with the Marylanders. But in September 1781, he was captured and sent to Philadelphia, and in the following month the surrender of Cornwallis occurred, four Loyalist corps being included (747 men). The King's vessel *Bonetta* sailed for New York filled with Tories. Thousands of Loyalists with their negroes now left the Southern States for Jamaica, the Bahamas, and Great Britain. When Savannah and Charleston were evacuated in July and December 1782, other thousands sailed with the troops. Up to May 1783, the population of East Florida was increased by about 13,000 whites and blacks. Jamaica gained approximately 5,900 white immigrants and 7,500 negroes from the Floridas, which were ceded to Spain, and from Savannah and Charleston. The increase in the Bahamas amounted to nearly 6,000, of which more than a quarter came from New York in 1783.

West Florida had been partly settled early in the war by Loyalist refugees from Georgia and the Carolinas. Several troops of these fugitives were mustered there, and were assisted by a large body of associated men of the Natchez District and some of the neighboring Indian tribes in repelling the expedition of Captain Willing from Pittsburg. These local troops, reinforced by a thousand men from New York, including the Maryland and Pennsylvania Loyalists, also resisted the Spaniards from Louisiana, but without avail. On the surrender of West Florida in May 1781 the Natchez associators fled, some to Savannah, some to the Cumberland settlements in Tennessee, while some were caught and carried down to New Orleans.

The British posts along the Great Lakes, including Carleton Island, Oswego, and Fort Niagara, attracted Loyalists from the back country in large numbers. A little colony of refugees sprang up on Carleton Island; many Loyalists were registered at Oswego while passing into Ontario to settle; and in the fall of 1775 Fort Niagara became the rendezvous of those coming in to join Butler's Rangers, a corps that comprised eight full companies in 1779. Brant and the Six Nation Indians also operated from this centre. Sullivan's raid up the Genesee River increased the number of savages at the post to more than 5,000. A Loyalist settlement was begun on the Canadian side of the Niagara River in 1780, which spread round the shores of the entire Niagara Peninsula and beyond by 1791. Both banks of the Grand River were colonized by the Mohawks and representatives of other tribes. At the west end of Lake Erie, Detroit was the headquarters of Tory refugees and the Wyandot and other Indian tribes. Here Lieutenant-Governor Hamilton embodied the Detroit Volunteers, who gained leadership when Capt. Alexander McKee, Simon Girty, Matthew Elliott and several other Tory conspirators came in from Fort Pitt in the spring of 1778. Hamilton had been sending raiding parties to the upper Ohio and promising land bounties to those who would join in the King's defense. These measures seem to have led the Loyalists of the frontier to associate for the purpose of aiding the British cause. However, numbers of the plotters were apprehended, and others were suspected, including the officers in the Indian Department at Fort Pitt, namely, McKee and Girty, and Elliott who was an Indian trader. At length, in March 1778, they fled to Detroit, where they were given employment in the Indian Department. Girty now became the instigator of war parties, which harried the frontier and gathered in adherents of the Crown. When peace returned the colonization of the region east of the Detroit River began. The King's ships brought in without charge disbanded Loyalists, and others had only to cross the river, as at Niagara. Within a few years three townships on the lake front, four on the river Thames, and extensive tracts along the Detroit and Saint Clair rivers were settled by willing exiles from the neighboring republic. See also LOYALISTS IN CANADA.

WILBUR H. SIEBERT,
Professor of European History, Ohio State University.

AMERICAN LYCEUM ASSOCIATION, an organization founded in 1831 for the purpose of (1) securing better legislative provision for schools; (2) to improve the qualifications of teachers; (3) to secure closer relationship between the common schools and the colleges; (4) to improve the methods of instruction and school discipline; (5) to introduce the natural sciences into the course of study; (6) to provide schools with books, apparatus and teaching appliances; and (7) to arouse an interest in the education of girls and women. Annual meetings were held, at which important reforms were advanced. The proceedings of the Association—to except the first—appeared in the *American Annals of Education;* and the *American Monthly Magazine.*

AMERICAN MANUFACTURES. See MANUFACTURES, AMERICAN.

AMERICAN MATHEMATICAL SOCIETY, an association established in 1888 as a local organization in New York, and reorganized in 1894 under its present name, to encourage an active interest in mathematical science. Admission fee, $5; annual fee, $5. Membership 700. Members meet at Columbia University, New York city; meetings are also held in Chicago and other cities. The society publishes two journals, the *Bulletin* and *Transactions.*

AMERICAN MEDICAL ASSOCIATION, The. On 5 May 1846, a National Med-

ical Convention of delegates from "medical societies and colleges in the whole union" convened in New York city. A second meeting was held in Philadelphia the following year and on 5 May 1847 this body resolved itself into The American Medical Association. The annual sessions of this organization are attended by delegates representing the several constituent State associations who assemble as the House of Delegates, transact the business and frame the policies of the organization; the sessions are also attended by those members of the organization who qualify as Fellows and meet as the Scientific Assembly for the discussion of scientific subjects. This Scientific Assembly includes an opening general meeting at which the president-elect is installed as president and delivers his presidential address; and 15 sections, in which are presented scientific papers on subjects related to the branch of medicine to the study of which the particular section is assigned. The following are the sections of the association: Practice of medicine; surgery, general and abdominal; obstetrics, gynecology and abdominal surgery; ophthalmology; laryngology, otology and rhinology; diseases of children; pharmacology and therapeutics; pathology and physiology; stomatology; nervous and mental diseases; dermatology; preventive medicine and public health; genito-urinary diseases; orthopedic surgery; and gastro-enterology and proctology. The constitution states: "The object of this Association shall be to promote the science and art of medicine. Contributing to this end, the Association shall endeavor to unite into one compact organization the medical profession of the United States for the purpose of fostering the growth and the diffusion of medical knowledge, of promoting friendly intercourse among American physicians, of safeguarding the material interests of the medical profession, of elevating the standard of medical education, of securing the enactment and enforcement of just medical laws, of enlightening and directing public opinion in regard to the broad problems of hygiene, and of representing to the world the practical accomplishment of scientific medicine."

AMERICAN MERCHANT MARINE. See MERCHANT MARINE IN THE UNITED STATES.

AMERICAN MICROSCOPICAL SOCIETY, an association organized in 1878 for the purpose of promoting microscopical studies by granting aid to members from invested funds and by publication. It has a membership of 350 and $4,000 in research funds.

AMERICAN MILITIA. See MILITIA.

AMERICAN MINES AND MINING. See MINES AND MINING; MINING ENGINEERING; MINING LAW.

AMERICAN MUSEUM OF NATURAL HISTORY, New York city, situated in Manhattan Park, occupies a palatial building extending along the whole front of the north side of 77th Street, between Central Park West and Columbus Avenue. The institution was incorporated under a charter of 6 April 1869, and is administered by a board of trustees, under a constitution revised and amended to 5 Feb. 1912. The foundation stone of the building was laid 2 June 1874. The Peary and other meteorites, the anthropological and ethnological collections made by the Morris K. Jesup expedition to the North Pacific regions, totem poles of the Ilaida Indians, masks and dishes from British Columbia, carvings from Vancouver Island, basketry and utensils of the Chilcoten and Kakima Indians, articles and models illustrating the life of the Eskimos of North America, the Shoshone Indians, the Gros Venties, attract the attention as the visitor enters on the ground floor and approaches the free lecture hall, with a seating accommodation for 1,500, which occupies a separate building at the extreme north of the museum. The Jesup collection of woods; archæological remains of New York; the Hyde collection from the ancient pueblos, cliff-houses and burial-caves of the Southwest; the collection of reproductions and casts of the ancient monoliths, bas-reliefs of Mexico and Central America presented by the Duke of Lonbat, as well as other rare specimens, all illustrate the pre-Columbian life of the continent. Animals, singly and in groups, masterpieces of the taxidermist's art, conspicuous among which are the cases of moose, bison, and musk-ox, are undoubtedly the finest in the world. Of particular excellence also is the collection of birds, especially the bird-rock group and the water-ousel group, and the butterflies and insects. Of great value is the collection of minerals, including the Tiffany exhibit from the Paris exhibition of 1889 purchased and presented by J. Pierpont Morgan; collections of meteorites and geological specimens, including the collection of the late Prof. J. Hall; and specimens of vertebrate palæontology, Cretaceous fish; an ichthyosaurus with young, showing it to have been viviparous; and hundreds of other specimens of bygone ages, priceless to palæontologists. On the top floor are the mounted skeletons of antediluvian monsters, the brontosaurus, giant sloth, mammoth, etc., the collection of shells, a laboratory for photography and a library containing over 55,000 volumes on natural history, accessible to members and students, including that of the Lyceum of Natural History founded in 1817 and incorporated in 1818, since 1876 known as the New York Academy of Sciences affiliated to the Museum.

AMERICAN MYTHOLOGY. American is here used with the signification of the United States. The myths to be dealt with and the social systems built up about them are much wider-reaching than the territory included within the American Union. They extend as far north as Hudson Bay, spreading over Ontario and the Canadian Maritime Provinces; while from Alaska they form an almost integral link with the beliefs, myths and institutions of the Eskimos, thus embracing all the Arctic lands of America. On the south some of the myths of the United States reach far into Mexico. Where necessary, therefore, these myths shall be followed to their habitat beyond the borders of the United States, provided in so doing their dominant characteristics may be the better presented. This article deals neither with the history of American mythology nor with the various systems of its interpretation, since these are still in an evolutionary stage; their literature is voluminous and an account of it is readily accessible. Moreover, this literature is largely personal while the object of the

present article is to present a condensed yet comprehensive view of the mythologies of the aborigines of the United States and the relation of these mythologies to the institutions, primitive beliefs, social evolution and peculiar modes of these peoples.

The study of American Indian mythology takes us into a condition of society different in almost every respect from our own. Here the laws of nature are unknown; and the Indian attributes life not only to everything that moves but to all the inanimate things of nature, the plants, earth, rocks, stones and water. To him the Sun in his daily journey was a very regal personage, possessed of great power and surrounded by other powerful spirits, warriors, faithful servants and followers; while the Moon was the sovereign lady of the night. The Sun and the Moon and the Stars were relatives and ruled the heavens, a region sometimes above, sometimes below that of the Thunder Spirits. The Four (or six) Winds were the Cloud-pushers and they ruled the Four Quarters of the earth. They sent the Spring, the Summer and the Winter, heat and cold, and they were generally the benefactors of mankind. To the Indian mind it was self-evident that the rivers, streams, lakes, oceans, plants and mountains had life, for were they not continually manifesting their activity in some way or other? And as the hills were the children of the mountains they must also necessarily be living beings. The Indian mind was ever awake to the voices of these sentient beings, the creation of his own imagination and want of knowledge. For him they whispered, spoke, whistled, chanted, they moved restlessly, they crept, they ran, they leapt, they jumped, they rushed with the force of a hundred armies and their roar drowned the mightest shout of the biggest war party. And they fought and struggled among themselves with greater fierceness, with mightier intensity and with more fearful weapons than the cunning of the wisest Indian tribes had been able to devise. Necessarily they could not do all this unless they were endowed with life. This life was essentially the same as that of the Indian for he knew of no other and could picture no other. He accounted for the extraordinary power of the various phases of nature by picturing them as possessed of great magic (medicine). These magic powers he extended alike to animate and inanimate objects; for as they were a thing apart from the being possessing them, and were in themselves supernatural beings, it was just as easy for them to reside in a dead stump as in a live tree, in a sleeping hill as in a heaving volcano, in a placid lake as in a roaring cataract. These unseen powers were constantly at war with one another and with mankind; and they had to be fought like the other enemies of the human race or placated when possible. The natural way to fight them was with their own weapons, incantations, charms and the whole paraphernalia designated by the Indian as "medicine." So about this idea of a universal, actual life throughout all nature sprang a vast mass of myths, traditions, folk-stories, ritual and ceremony which constitute a very important part of the mythologies of the races of the American continents. The priests or medicine men were the interpreters of the religious and philosophical knowledge of the tribes. They were also, for the most part, the depositories of the supernatural agencies to be used in the struggle which man was constantly waging against the supernatural powers by which he was surrounded. Hence the religious ideas of the Indian races are always associated with their philosophy, their attempts to account for the origin of the universe and all that is contained therein, together with the various forms of animate and inanimate nature, the peculiar habits, shapes, markings and characteristics of fishes, reptiles, birds, other animals, men and the imaginary creatures who peopled the water, the air and the earth with the regions round about its outer edge, below it and within it. The Indian accounted, by means of a heterogeneous mass of myths and stories, for the position, form, color and shape of mountains, hills and valleys, of forest-covered lands and barren wastes, of smooth, water-washed seacoast and wild, wind-swept, desert sand-dunes. Everywhere he has written his peculiar mode of thought and his primitive culture upon his institutions, his myths and his stories. But to understand these we have to be able to place ourselves in his position and to see through his eyes that curiously-real world of fancy that populated his universe.

Metamorphosis.— The belief in the power of certain enchanters to take upon themselves at will the forms of animals, fishes, birds, flowers, plants, sticks, stones and other objects was general throughout the American continents. Sometimes it was not an individual but a whole tribe that possessed this power. Animals could also metamorphose themselves. The Supernatural People who are sometimes identified with the souls of the dead and sometimes looked upon simply as strange non-human beings are, in Indian myths, fond of assuming the forms of animals. Thus Wakiash, the Kwakiutl hero, on his long journey in search of knowledge to impart to his tribesmen, came to the village of the Supernatural People just as they were holding a great animal dance. He inadvertently restored them to their human form and gained a great store of information from them. This belief in metamorphosis fits in with that of the Indian doctrine of the universal wisdom of all created things, their relationship to man and their close communion with him. It is quite common among the Indians of the United States and Canada and it is one of the most familiar features of their myths and stories. Even in much more cultured Mexico and Yucatan the people firmly believed that the priests could change themselves into dogs, pigs, tigers and other beasts. Any one encountering them in this form was almost sure to meet with sudden death. Women giving birth to misshapen children were thought to have been bewitched before childbirth by one or more of these sorcerers. Even the dead are believed by various American tribes to have the power of assuming many forms by means of their great sorcerer knowledge, thus making themselves doubly powerful, fearful and dangerous. This belief was carried even further. The sorcerer could not only change himself into innumer-

able shapes, but he could visit the land of the dead and marry the dead; and spirits from the land of the dead were universally believed to have carried off young women and made them their wives and to have had children by them. The Sun, the Moon, the Evening Star, the Wind Gods and the Thunder Spirits frequently visited this earth and made love to earthly women and begot children earthly in form but possessed of the wonderful powers and attributes of their divine parents. Hiawatha's grandmother fell from the moon, and his mother, born upon earth, was betrayed by the handsome West Wind. Though born upon earth, Hiawatha inherited all the powers and attributes of his divine parents. From his mother he received the arts of healing and of producing growth, and through his father he had all the active qualities inherent in the winds and was the messenger bringing supernatural knowledge to his people.

As the inherent power of animals, men and spirits was essentially the same in all cases, everything done by a power greater than man's was accomplished by means of magic. Even the greatest of the gods and the most terrible and powerful of spirits from the Land of the Supernatural People were no exception to this rule. Hence they could be and frequently were overcome by magic greater than theirs. The powerful magicians of the earth went to the land of the dead and even to the home of the gods and overcame the most powerful of the spirits of the Supernatural Lands. When the spirits of the clouds and the air withheld the rain the most renowned medicine men of the tribe with their strongest "medicine" were called upon to overcome them and to force them to comply with the wishes and supply the necessities of man. Frequently the whole tribe was summoned to take part in these incantations on the principle that each member of the tribe possessing his own special aiding spirit, the whole combined ought to be more effective and powerful by adding it to the knowledge and dread formulæ of the priests. This cojoint power of the tribe is very important when it is remembered that upon it depend, in the Indian imagination, their enjoyment of rain in season, harvests, good and bad weather, sunlight, heat and cold, sickness and health, life and death, and even the rising and setting of the sun and the moon and the regular coming and going of the seasons. Upon the placation of the non-human spirits or the contravention of their magic evilly directed depends also the fertility of the human race, and hence its preservation. So young girls about to be married and sterile women resorted to magic to assure that fertility for which they longed. These generally took the form of prayers and powerful incantations and offerings to the Moon Goddess, the greatest of the divinities of growth.

Province of the Myth.— Story-telling was common among most of the American Indians. This is a general characteristic of savage and barbarous races. It is the evidence of their social and intellectual progress. Before the popularization of education man perpetuated his acquired knowledge in the form of stories, whether in prose or verse. The whole body of these stories contained his philosophy of life, his customs, his traditions, his history and his explanations of all the phenomena of nature. At the time of the discovery of America the races of the New World were some of them in the stages of savagery and others in the advanced stages of barbarism. So a wide stretch of the highway to civilization separates the lowest of the American races from the highest. Yet they are all distinguished by certain racial characteristics whose ear-marks are constantly in evidence in their social and religious systems, in their presentation of scientific truths and in the general aspect of their very numerous myths and folk-tales. Even in Mexico, Central America and the west coast of South America, where several races had attained to a comparatively high degree of culture and become acquainted with many of the elementary principles of science, the masses of the people still displayed, at the time of the conquest, an all-reaching, unreasoning credulity. The origin of the world, the creation of the human race and the lower animals, the vegetable and inanimate kingdoms, the sun, the moon and the other planets and their movements; the peculiar markings and characteristics of animals, the typical customs and institutions of men, language, medicine, social and religious institutions, all knowledge in short, are explained by the American Indians by means of myths and stories. To these we must go if we would read aright the past and the present of the Indian. There and there only have we the privilege of examining his philosophy and studying his scientific knowledge, his religious beliefs, his social polity, his code of morality and his general attitude toward the mysterious world in which he lived and struggled. They teach us that the tribe of the stars, of which the sun was the father and the moon was the mother, ruled the upper heavens; that the Thunder Spirits, in various forms, peopled the lower air and the tops of the highest mountains, while the four great winds ruled the four parts of the earth. On the earth itself the various spirits of growth and germination carried on their beneficent work for all sentient beings, while within the earth were confined, by magic, other mysterious beings, which assumed varying forms and attributes with different tribes. The Indian myths show us the relation of all of these beings to one another, to man and to the great magic found everywhere throughout the universe. They introduce us to the imprisoned spirits in mountains, trees, plants, stones and rocks; to the powerful beings who guarded the fire and the water and they show us how primitive man overcame them and secured the elements he lacked in his progress toward a higher life. To the Indian imagination all these regions and beings were terribly real. There are evidences in plenty that a tendency to combine, assimilate and rationalize all Indian knowledge and beliefs, according to the method of reasoning of savage and barbaric man, has been at work for many centuries. The myths and customs, political, social, economic and religious, overlap, mingle and apparently contradict one another. They exercise their influences in various ways and through distinct mediums. The tribal story-teller, the slave, the hostage, intermarriage between tribes, the union of

clans for defense or other purposes, the blending of races through conquest or the peaceful absorption of one tribe by another, all aided in the mixing of myths and folk tales and the blending of customs and beliefs; so that, in the study of the myths of the American continents, we are confronted with a tangle of threads of myth, legand, story, custom, religious beliefs and practical supersitions. Yet amid this tangle the parent myth is often discernable. The cycle of stories relating to Nanabozho, the great culture hero of the Algonquins, is one of these. This myth, with slight variations, is or was the common property of the many tribes and sub-tribes of the Algonquin race, and similar myths are to be found in neighboring tribes.

Superstitions in regard to Animals.— Most of the Indian races of the North American continent had a peculiar superstitious fear of animals, which they believed exercised a strong influence over their lives, their well-being and their ill-being. There were a number of ways in which this animal power might be contravened. Incantations and prayers, charms and other shamanic medicines were often effective and a piece of the animal feared carried about the person was generally strong medicine in warding off the threatened danger. This belief, which was not peculiarly American, survives among white people in the custom of carrying a rabbit's foot or similar charms against ill luck. And we talk about working a rabbit's foot on some one. Among certain of the Algonquin tribes the rabbit's foot was looked upon as very strong medicine. The Indian hunter carried a rabbit's foot in his hunting bag and with it parts of the animals he expected to hunt. This he believed was an effective way of preventing the spirits of the animals he killed from troubling him or doing him harm. This Indian dread of animals is well illustrated in an Algonquin myth, which is found in various forms among other Indian tribes. As man became more and more powerful through the knowledge he had acquired and the weapons he had invented or secured, his power over the animal creation became more and more dominant. For this reason he was greatly hated by them. At last he slaughtered so many of them that, fearing extinction, they called a meeting of all their kind, with a view to devising some means to curtail man's power over them. Among the animals there were as great or greater medicine men than among men; and they finally decided to visit upon the human race all the plagues known to their combined enchantments. Each animal medicine man was called upon to do his worst in this direction. The deer agreed to visit man with rheumatism, lumbago and all like muscular diseases; the reptiles offered to trouble him with fearful dreams; the poisonous animals agreed to pester him with their stings and bites; the birds contracted to affect him with lung troubles, coughs and colds; while the insects agreed to inject into his system all sorts of malarial fevers. Thus came disease into the world. As this myth was ever present in the mind of the Indian hunter he was scrupulously exact in the observance of the means offered him to avoid such evil effects as were likely to come to him from the enmity of the animals he killed in the chase. Many Indians would not kill the animal represented by the totem of their clan, while others were in the habit of begging the pardon of the animals they were about to slay, explaining to them, at the same time, that the killing was done only as an act of necessity. It was the firm belief of the Algonquins and other tribes that the deer had the power of visiting his slayer with lumbago, rheumatism and other similar diseases. This belief was no doubt largely influenced by the disease myth already related. The Crees and other Rocky Mountain tribes held the same belief with respect to the bear; and they also begged his pardon and addressed him as brother before killing him. Western tribes and the Plains Indians believed that certain of the bird tribe had the power of bringing trouble upon mankind; and numerous myths deal with the means used to divert the danger. Some of these gradually became elaborate ceremonials.

How a Knowledge of Medicine Came to Man.— It is good to have the chipmunk near the home because he has always been the friend of man and brings good luck with him. He rode with Hiawatha on the bow of his self-moving, wonder-made canoe, and the Indian prophet called him his "very good friend." The Indian will never kill a chipmunk because, after man had been visited with a plague of diseases by the animal council, the chipmunk alone among all the animal creation was sorry for him; so he went among the trees and plants, told them what had happened, represented vividly the wretched plight of his good friend man and obtained their help to fight the new plagues. The pines, the balsams and the spruces gave their gums and balsams, the slippery elm its bark, the sassafras its roots, the mandrake its apples, the wintergreen its berries and the catnip and bonset their teas to cure colds. Ginger, gentian, sarsaparilla, peppermint and all the medicinal plants each helped in his own way; and the little chipmunk or ground squirrel it was who brought all these remedies to suffering mankind. So it is quite natural that he should take a quite peculiar and proprietary interest in the human race; and it is only reasonable that humanity should remember its debt to him.

Fetishes.—The fear of the secret power of animals exhibited by the American Indian; his belief in their superhuman attributes and his conviction that these powers can, under proper control, be used to his own advantages, are embodied in the use of amulets or fetishes, which are thought to be the seat of magical power, actually or symbolically. The eagle, the most powerful member of the feathered tribe known to the Indian, was supposed, under certain conditions, to possess magical powers. He was the representative of the Great Thunder Bird to the Plains people; and as such was held in great respect. His feathers constituted the badge of honor most highly esteemed by the Indian chief over a wide extent of United States and Canadian territory. It is quite natural, therefore, that his talons, the symbols of his power, should constitute powerful fetishes; and as such they were carried by many a brave on his war expeditions. The fetish, which nearly always consisted of some object, could be transferred,

bought or sold. It therefore formed an article of some considerable importance in Indian commerce. According to a Zuni myth, in the early days, the animals of prey were possessed of great strength and cunning; and as they were at eternal enmity with the human race it was in great danger of disappearing from the earth. So the Two Gods struck many animals with lightning from their magic shields and turned them into stones. They allowed them to preserve, in their new condition, all their former qualities, attributes, powers and virtues in a quiescent state, without the power to exercise them for harm to man; but they were permitted to use these powers for his benefit when they felt so disposed. This is why a fetish of one of these transformed animals is often very efficient in bringing luck to the possessor. This luck, however, depends upon the will of the spirit enclosed within the fetish itself, whose attitude can only be learned by experiment. So the Indians were constantly experimenting with fetishes; and those which were found not to be well disposed to help their possessors were discarded, sold, traded or exchanged for others. This fate happened to tribal as well as personal fetishes; for one of the most precious possessions of the tribe or clan was its traditional fetishes, handed down for generations and having attached to them wonderful myths and stories of their origin, history and magical powers together with many folk-tales of the help they had brought, from time to time, when their aid was urgently needed and solicited. Thus it will readily be inferred that a fetish which was not disposed to help one person or tribe might be all powerful when in the possession of another; since it was only a question of willingness on its part.

A great number of stock fetishes like the eagle's talons, the feet of the rabbit, the paw of the bear, the teeth of the tiger and the most symbolical parts of other fierce animals were suggestive of the natural and supernatural qualities of the animals to which they belonged. Among many tribes the rabbit fetish was even more feared than those of the fiercest of animals; for he obtained his reputation as a necromancer on account of his being the totem of the culture god Nanabozho, one of the greatest of magicians known to Indian mythology. The survival of the rabbit superstition is still strong among the Indians of the Plains and of the wooded countries to the north and east. Half-breeds of the Canadian Northwest and the negroes of the South of the United States alike have assimilated the Indian faith in the efficacy of the rabbit's foot. It was and still is an Indian belief that the fetish, in return for the good done its possessor, demanded special deference and attentions in the shape of prayers, incantations and sacrificial offerings, which were duly given it. Great festivals were often held by the tribes in honor of the tribal fetishes. Many of the so-called ornaments of the American Indians were primarily fetishes. It is therefore very difficult to draw the line which separates the fetish from the ornament. The many legends of talismanic jewels so implicitly believed in during the Middle Ages and even in more recent times, among all classes and races in Europe, show that the fetish, in becoming purely ornamental, still retained, in the minds of many, in particular cases, its traditional powers. The tribal fetish, like the oyraon, guiding spirit of the Iroquois, might be, and frequently was, revealed in a dream or vision or in some miraculous way; and often the Indian youth, when performing the fasting customary before entering upon the duties of manhood, had one or more powerful fetishes revealed to him. Sometimes he was favored with one or more of these which had the ability and the will to help the whole tribe. In such cases the youth was sure to become a medicine man of note; which did not prevent him also becoming a great warrior. In this way some of the fetishes contained in the medicine bags of the medicine men were obtained. While the objects in the medicine bags were symbolical of ritualistic ideas, many of them, if not all, are supposed to have been fetish in origin and powers.

A fetish may be a stone, a rock, a piece of wood, an arrow-head, a feather, in fact anything. It may have real power residing within itself as in the case of a rock or stone; it may derive its power from being a part of a well-known whole, as the feather of the eagle; or it may have a power derived from its symbolism, as the foot of the rabbit, the totem of a divinity. The fetish associations may make a hero of one of the most stupid of animals, as in the case of the rabbit just cited; around which have been woven countless stories, in which the totem of Nanabozho is generally the hero and the conqueror on account of his natural shrewdness, his cunning and his miraculous powers. Trophies obtained from slain enemies often proved most effective fetishes; and it is very probable that the scalp taken by the American Indian from his fallen foe was primarily looked upon as a fetish, since numerous superhuman Indian characters could be wounded only in the crown of the head; or, in other cases, like Sampson, their strength resided in their hair. This myth was as widely spread in America as in Europe and Asia.

Ceremonies.—The many Indian ceremonies observed throughout the American continents until quite recently covered a very wide field of relationships of society, of the individuals to society as a whole and to one another. They referred to birth, childhood, manhood, marriage, death and every important movement of life. The ceremonies, however, are naturally largely taken up with the food supply, war and the preservation of the tribe and the individual from the dangers that threatened them from the magic power of ill-disposed magicians. This latter include the means taken to assure mankind against disease, always caused by the wiles of the enchanter who send evil spirits into the human body. Among the more cultured tribes elaborate ceremonies are made use of to pay due deference to the most revered or feared of their divinities. The ceremonies of the American Indian are ritualistic and the order of the ritual must be implicitly followed to assure results. Ceremonies consist of two classes — secret and public. In the former only the initiated can take part while in the latter the whole tribe may, in most cases, participate. The secret ceremony is nearly always preparatory to the public ceremony. In it are pre-

pared all the paraphernalia to be used in public by priest and layman, such as dresses, masks and other distinctive markings, upon which is placed the stamp of sacredness belonging to all things and ceremonies connected with the Sacred Tepee. Ceremonial smoking, prayers and sacrifices form a part of the secret ceremonial. An altar almost always occupies a prominent position in the place of ceremonies and on it are laid symbolical representations of the chief tribal gods, of the Spirits of the Four Winds (or six) and the Four Quarters of the World governed by them, of vegetation, thunder, lightning, the rainbow and other personifications of the more prominent phases of nature. Possessions of priests, traditional and tribal songs, music and dancing accompanied by rattles, drums and whistles, costumes of special ceremonial significance, tattooing and body painting form part of the ceremonial of a tribal festival. Each distinct ceremonial performance has its own ritual, costume, dances and symbolical representations. The more cultured the Indian tribe or nation the more numerous and complex the ceremonies. The Peruvians, the Aztecs, the Mayas and other cultured races of Mexico, Central and South America and the Pueblo Indians had a network of ceremonies which covered from a fourth to a half of the year; and symbolized almost every conceivable activity of life. They began even before the child was ushered into the world and continued after the individual was dead and buried. The Hopi Indians still have 13 great ceremonies each of nine days' duration, all of which are performed with a very elaborate obligatory ceremonial; and, in addition to these, they have others which cover only one day. As their land is dry the rain god plays a very prominent part in all their ceremonies. In ceremonial significance, variety, richness of detail and strictness of ritualistic observance these tribal festivals of the Hopi Indians are equalled on the American continents only by those of the civilized nations of Mexico, Central America and Peru at the time of the conquest. The ceremonies of the American races vary widely between the broad extremes of extended symbolism just instanced and the almost purely medical dances of some of the more primitive of the tribes. Among other tribes, as the Kwakiutl, the ceremonies are almost altogether priestly functions, as they were in Mexico and Central America.

The Sun-Dance is a ceremony in use among all the Plains Indians, some of whom observe it as an annual event in the tribal life, while among others it is resorted to only on some special occasion. It lasts from one to 8 or 10 days and is generally held about the time of the summer solstice. The first days of the ceremony are devoted to the rites of the sacred (secret) tepee and the others to public ceremonies in which all the members of the tribe take part, in varying capacities according to their rank, age and relationship to the tribal traditions and ceremonies. The sacred tepee rites commemorate and represent the acts originally performed by their inventor on the Sacred Mountain. The Sun Dance of the Plains Indians had its origin in days of famine now long past. An Indian with his wife went into a mountain, where he fasted, prayed and met a great medicine manitou from whom he learned the sacred ceremonies of the Sun Dance. Returning to his tribe he performed these ceremonies and the famine ceased, for the buffalo came in vast herds covering all the plains. At the time of the holding of the Sun Dance the rank of the chiefs was renewed, the young chiefs were singled out for their bravery and publically commended, and the dead were remembered. Often, too, it was a season for renewing tribal friendships. The ceremonies included a veneration of the Four Earth Quarters; special honor was paid to the Sun as the Great Mystery and the "Very Great Medicine Man Above." He was represented by symbolical characters painted upon the centre pole of the tepee. In the dance ceremonies four old men represented the four wind gods of the four quarters of the world; while all the dancers wore wreaths symbolical of the Sun, the Moon, the Morning Star and the Four Wind Gods. Whistles were frequently used to symbolize life (the wind in its active mood), and the call of the Thunder Bird from out the clouds driven by the winds, the Cloud Pushers. The whole dance ceremony formed a great aboriginal dramatic representation, a far-reaching and wide-influencing myth developed under the influence of the priestly class to keep vividly alive the tribal traditions embodied in the acts of the several days of the dance.

The Thunder Bird, which was symbolically represented in the ceremonies of the Sun Dance, is a personification of the thunder and the lightning. The myths relating to it cover a vast extent of territory stretching from the Atlantic to the Pacific. Sometimes the myth presents one great bird, sometimes several, in the latter case all of different colors. In general the Thunder Bird was the helper of man, and in this respect he may be classed with the culture heroes; for to him the culture gods of the Pacific were beholden, on several notable occasions, for the things which they taught mankind. Wakiash, the great hero god of the Kwakiutl, made his memorable journey down the Pacific coast countries on the back of the Great Thunder Bird whom he met in the mountains after a long fast, prayers and other observances preparatory to becoming a medicine man; and it was with the aid of this same supernatural agent that he was enabled to bring back with him the first totem pole and house known in the land of the Kwakiutl. See also FOLK-TALES AND MYTHS OF THE AMERICAN INDIANS.

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JOHN HUBERT CORNYN,
National University of Mexico.

AMERICAN NATIONAL PARTY. See AMERICAN PARTY.

AMERICAN NATIONAL RED CROSS. See RED CROSS SOCIETIES.

AMERICAN NEWSPAPERS. See NEWSPAPERS, AMERICAN.

AMERICAN NOTES, a work by Charles Dickens, published in 1842 and embodying his impressions of the United States.

AMERICAN NUMISMATIC AND ARCHÆOLOGICAL SOCIETY, an association organized 1858, incorporated 1865. Its objects are the collection and preservation of coins and medals, the investigation of matters connected therewith, and the popularization of the science of numismatology; also the collection, examination and elucidation of the antiquities of this and other countries. Membership about 300. See NUMISMATICS.

AMERICAN ORNITHOLOGISTS UNION, an association organized in 1883 for the advancement of its members in the science of ornithology. Membership, 825. It issues a quarterly magazine, *The Auk*. See ORNITHOLOGY.

AMERICAN PAINTING. See AMERICAN LANDSCAPE PAINTING; PAINTING, AMERICAN.

AMERICAN PARTY, the name of three separate political organizations in the United States.

1. The only one of great importance, usually styled "Know-Nothings." The genesis of this party lay deep in the nature of American settlement and history. The Constitution crystallized political parties definitely into Federalists and Anti-Federalists: the one upholding firm government on the general European model, with the local aristocracies in the ascendant; the other desiring the least possible government of any sort, and no upper-class ascendancy. Immigrants who had left Europe because of too free indulgence in freedom of speech, thought and action, allied themselves with the Anti-Federalists, which led the incensed Federalists, on gaining power in 1795, to raise the term for naturalization from two to five years, and in 1798 to 14 years, besides passing the Alien and Sedition Laws (q.v.). The Republicans, coming into power with Jefferson in 1801, in 1802 repealed the obnoxious acts and restored the term to five, swelling their ranks for years with a relay of acrid foreign democrats. Six members of the Congress which declared the War of 1812 against Great Britain were members of the Society of United Irishmen; and the Federalist Hartford Convention of 1814 brought forward a provision against aliens holding office. Quiescent for many years, the movement revived (1835) in New York city, where a compact and clannish foreign body of immigrants, avid of office and openly allying themselves as foreigners against the natives, was accumulating; one procession bore a transparency lettered "Americans shan't rule us." The religious question was also then, as since, a formidable factor in the trouble. In 1843 the Democrats carried the city by a close vote, and distributed the majority of the offices to foreigners, with the result that in the November election for state senator an "American Republican" candidate polled nearly a fourth of the vote, and the next spring a "Native American" candidate defeated the Democrat by 4,000, and the regular Whig party nearly vanished in the city. The excitement spread to New Jersey and Philadelphia; riots between natives and foreigners cost some lives and much property, including two Catholic churches. The Whigs voted with the Native party to secure its vote for Clay; but finding that its resulted in Native local officials and Democratic presidential majorities, drew off, and by 1847 the Native party had pretty much disappeared. Clay in 1844 had six Native American electoral votes, four from New York and two from Pennsylvania; and for some years the Middle States cast small votes for the party.

A new birth came to it about 1852. The Fugitive Slave Law of 1850 had largely dissolved and recombined both Whig and Democratic parties, and those of the former who wanted the status quo on slavery without public agitation cast about for a new issue to keep their organization together. The Native American issue was temptingly at hand, and indeed had never ceased to be a sore in the Whig mind. The tremendous flood of foreign immigration set going in part by the Irish famine of 1847, in part by the revolutionary movements of 1848–50 on the Continent, had kept a steady stream of reinforcements pouring into the Democratic party which almost swamped the Whigs and made it quite impossible to win elections except by fusions that sacrificed all political principle or consistency; they felt it a genuine wrong to the native or long-resident classes, and there was nothing in the use to which the other party put their victories to make them feel otherwise. They now developed a secret oath-bound society whose real name was "Sons of '76, or Order of the Star-Spangled Banner"; but its name or precise object (of course they knew its general aim) was not revealed to members till the "lodges," which they instituted in imitation of the Masons, had raised them to the higher degrees. Hence their stock answer to questions concerning it was "I don't know," which became the popular motto of the order and gave them the nickname of "Know-Nothings." The evils it "viewed with alarm" were the increasing power of the Roman Catholic Church, the vast sudden flood of immigration which was taking the control of the United States out of the hands of its citizens, and the greed of foreigners for office which greatly multiplied the danger from their actual number. Its motto, or at least the essence of its principles, was "Americans must rule America,"—doubtless with a reminiscence of the foreign motto before mentioned; and the countersign at its lodges was an order said to have been issued by Washington at some un-

specified occasion, "Put none but Americans on guard to-night." It acted in politics, not by putting up separate tickets, which would have kept tally on it and given the other parties a clear target and open victory, but by endorsing selected candidates of the others in secret convention of delegates from lodges, at which every member must vote or be expelled. This could not be known till election, and hence made havoc of all political calculations and left the workers beating the air. The Kansas-Nebraska Bill, which extinguished the Whig and created the present Republican party, and made the slavery issue one of life or death, drove into the Know-Nothing party a vast number of the moderate section not yet ready to oppose the South; it now took or was given the name of the American party, and came into the open field. In 1854 it carried Massachusetts and Delaware and polled over 120,000 votes in New York State. Thus far it had been almost wholly a Northern party; but in 1855 it made deep inroads in the South as well, where foreigners were few and the issue was locally innocuous. In that year it elected the governors and legislatures of New Hampshire, Massachusetts, Rhode Island, Connecticut, New York, Kentucky and California; the controller and legislature of Maryland and the land commissioner of Texas; and narrowly missed carrying the legislature of the latter, and those of Virginia, Georgia, Alabama, Mississippi and Louisiana. But even at this time, when it was sweeping all before it, and the conservatives of both parties were crowding into it panic-stricken to avoid the real issues hurrying the country to the precipice, keen observers saw its hollow ephemerality: Horace Greeley of the New York *Tribune* said that "it contained about as much of the elements of permanence as an anti-cholera or an anti-potato-rot society." With 1856 it came into the national field, and for slavery tried to substitute terrific visions of a revival of the terrors of the Inquisition; denounced Archbishop Bedini, the papal nuncio, as an emissary of diabolic designs; and forced public discussions in which all the misdeeds of the mediæval Christian Church before and after 1520 were recounted. February 1856 a national nominating convention was held at Philadelphia; and its outcome, to the disgust of the majority, turned on slavery after all. A secret "grand council" held a session 19–21 February to draft a platform; and after three days of violent contention reported as part of it this curious "straddle," in later political slang: That all public offices should be given to native-born citizens, and the term before naturalization be 21 years; that "all laws" (that is, the Fugitive Slave Law) should be enforced till repealed or declared unconstitutional; that Pierce's administration be reprobated for repealing the Missouri Compromise; and that State councils be recommended to drop their "degrees" and substitute a pledge of honor from members,— that is, that it cease to be a secret terror to other parties and be one itself. But this meant death, as did its absurd attempt to gain Northern votes by opposing the Kansas-Nebraska Bill, and Southern votes by upholding the Fugitive Slave Law. In the open convention of 22 February, 50 Northern delegates offered a resolution that the secret grand council could not bind the convention by a platform; and on its rejection withdrew. The convention then nominated Millard Fillmore of New York for President, and Andrew Jackson Donelson of Tennessee for Vice-President; and the Whig national convention later adopted the nominations, but made no reference to the platform. In the spring of 1856 the party still increased its power, there being only local issues at stake; New Hampshire and Rhode Island elected "American" governors, making eight of the 32 States in their hands. But the presidential election showed what a phantom the party was: Fillmore gained the electoral vote of but one State, Maryland, with eight electors; the popular vote was 874,534 out of a total of 4,053,967; and in New Hampshire it sank from 32,119 for governor in spring to 422 in face of the real issue. It elected 15 or 20 Congressmen, carried Rhode Island and Maryland State elections in 1857, and in the Senate of December had five members. In the Congress of 1859 it had become a Border State party, with one Senator from Kentucky and one from Maryland, and 23 Congressmen,— three from Maryland, five from Kentucky, seven from Tennessee, one from Virginia, four from North Carolina, two from Georgia and one from Louisiana. In the campaign of 1860 its members largely made up the Constitutional Union (Bell-Everett) party, which tried to avert the war. The party was by no means without its use: it brought forward many strong leaders who did good service in the real parties when the issues had shown themselves inevitable.

2. A party directly adverse to the first in being founded on opposition to secret societies: organized by the National Christian Association at the adjournment of its convention at Oberlin, Ohio, in 1872. Organization was completed and the name adopted at a convention in Syracuse, N. Y., in 1874. At Pittsburg, 9 June 1875, a platform was adopted demanding recognition of the Sabbath, introduction of the Bible into public schools, prohibition of the sale of liquors, withdrawal of the charters of secret societies and prohibition of their oaths, international arbitration, restriction of land monopolies, resumption of specie payments, justice to the Indians and direct popular vote for President and Vice-President. James B. Walker of Illinois was nominated for President. In 1880 it again made nominations; in 1884 S. C. Pomeroy was nominated but withdrew in favor of John P. St. John, the Prohibition candidate.

3. A party organized at a convention in Philadelphia, 16–17 Sept. 1887. Its platform demanded a 14-years' residence for naturalization; exclusion of anarchists, socialists and other dangerous characters; free schools; the building of a strong navy and coast fortifications, and internal improvements; prohibition of alien proprietorship; permanent separation of church and State; and enforcement of the Monroe Doctrine.

FORREST MORGAN,
Connecticut Historical Society.

AMERICAN PATRIOTIC SOCIETIES. See PATRIOTIC SOCIETIES.

AMERICAN PEACE AND ARBITRATION LEAGUE. The corporate purposes of this organization favor universal peace by conciliation and arbitration through a permanent international court, arbitration treaties between

all nations, and adequate armament for national security.

AMERICAN PEACE SOCIETY. This society was organized in New York city 8 May 1828, and was formed by the merging of many State and local societies, the oldest of which, The New York, dated back in 1815. Located in Boston from 1837 to 1911, headquarters were removed to Washington, D. C., 1 May 1911.

AMERICAN PHILOLOGICAL ASSOCIATION, a society inaugurated by William D. Whitney, of Yale, at Poughkeepsie 1869 as an outgrowth of the Oriental Society, Classical Section. Its object is the "advancement and diffusion of philological knowledge"; it publishes an annual volume of 'Transactions' and also 'Proceedings,' detailing its meetings and giving titles of papers presented. It has a membership of some 718.

AMERICAN PHILOSOPHICAL SOCIETY, The, is the oldest scientific society in America. Benjamin Franklin, in his 'Autobiography,' states that in the year 1727 "I united the majority of well-informed persons of my acquaintance into a club which we called the Junto, the object of which was to improve our understandings." As the population of the colonies grew, Franklin saw the need of another society of larger scope and usefulness than the Junto; therefore, in 1743, he issued a circular, entitled 'A proposal for promoting useful knowledge among the British plantations in America,' in which he urged "that one society be formed of virtuosi or ingenious men residing in the several colonies, to be called The American Philosophical Society, who are to maintain a constant correspondence. That Philadelphia, being the city nearest the centre of the colonies, communicating with all of them northward and southward by post, and with all the islands by sea, and having the advantage of a good, growing library, be the centre of the Society."

The proposition was favorably received, and in the following spring Dr. Franklin wrote to Gov. Cadwallader Colden, of New York, that the Society "is actually formed and had had several meetings to mutual satisfaction." He gave a list of the members, and added that "there are a number of others in Virginia, Maryland, Carolina, and the New England colonies who we expect to join us as soon as they are acquainted that the Society has begun to form itself."

In January 1769 this Society united with the Junto, which had in the meantime changed its name to "The American Society held at Philadelphia for promoting Useful Knowledge," and the united societies took the fused name of "The American Philosophical Society held at Philadelphia for Promoting Useful Knowledge," and elected Benjamin Franklin its first president, and he held this office by successive annual re-elections until his death in 1790.

The Society at once entered upon arrangements to carry out a notable scientific undertaking of great magnitude for those days, namely, to make observations of the expected transit of Venus in the following June—a rare phenomenon which had not occurred for 130 years and would not recur for 105 years. It erected three temporary observatories and appointed a committee, of which David Rittenhouse was the head, to have charge of the observations. On the day of the eclipse the weather in northern Europe was cloudy, but in the neighborhood of Philadelphia it was perfectly clear, and a high European authority has said that "the first approximately accurate results in the measurements of the spheres were given to the world, not by the schooled and salaried astronomers who watched from the magnificent Royal observatories of Europe, but by unpaid amateurs and devotees to science in the youthful province of Pennsylvania." The results of these observations were printed in the first volume of the Society's 'Transaction,' published in 1771. The publication of the quarto 'Transactions' still continues, and in addition the society publishes 'Proceedings' in octavo form.

Franklin was succeeded in the presidency by David Rittenhouse, the eminent astronomer, who held the office for five and a half years, until his death in 1796, and he in turn was succeeded by Thomas Jefferson, who held the office until 1815, including the eight years of his incumbency of the Presidency of the United States. "The tranquil pursuits of science," he wrote, were his "supreme delight," and the most exciting political duties could never withdraw him from them. Jefferson was succeeded in the presidency by Dr. Caspar Wistar, the eminent anatomist, and subsequent incumbents were Dr. Robert Patterson, Chief Justice Tilghman, Peters S. Du Ponceau, Robert M. Patterson, Dr. Nathaniel Chapman, Dr. Franklin Bache, Prof. Alexander Dallas Bache, Judge Kane, Dr. George B. Wood, Frederick Fraley, Edgar F. Smith and Dr. William W. Keen.

The membership of the Society since its foundation has included names distinguished in science on both continents. The number of members who may be elected in any one year is limited to 15 residents of the United States and three foreign residents. The election of members is held during the general meeting in April of each year. The ordinary meetings of the Society are held on the first Friday of each month, from October to May, inclusive. The Society possesses a library of over 65,000 volumes, which is specially rich in the files of the publications of the learned societies of the world, and is housed in a fire-proof building erected on Independence Square in the city of Philadelphia, on land granted to it by the State of Pennsylvania in 1785.

I. MINIS HAYS,
Secretary American Philosophical Society.

AMERICAN PLATE. See SILVERWARE.

AMERICAN POLITICAL ISSUES, 1788-1852. By this term is here meant the issues which swayed the voters in the Presidential elections, and in the Congressional elections of the Presidential years. These elections were the "round-up" or register of the accumulated drift during the four years previous, and formed one of the influences deciding the drift during the next four. They fall into five periods: 1788–1800, 1804–12, 1816–20, 1824–40, 1844–52. In the first, the Federalists are in power; the controlling issues are those of strong *v.* weak government, and of deference to the educated classes *v.* the *vox populi.* In the second, the Federalists are the opposition,

fling away the excuse for their existence, and after a casual sectional revival are extinguished. In the third, there are no issues and no party, properly speaking; the candidate is accepted by inertia from the old line of leaders, and the administration is able to grant the chief wishes of both the old sections. In the fourth, the former Federalist elements recombine under new names, with the basis of a strong pending and nationalizing government, replacing the dead issue of a strong executive one. In the fifth, the slavery question is the central issue.

1788.— The division over candidates has usually and naturally coincided with the division over policies; but in the first election, of 1788, it was not so. There was but one possible candidate, Washington; he represented all parties. He had seen the Revolution nearly aborted first, and the Confederation nearly wrecked afterward, by the weakness of the central government; this confirmed his natural bias as a "nationalizing" Federalist, anxious above all things for a government which could keep order, pay its debts, and secure respect from other nations. On the other hand, as a Southern farmer, he commanded the confidence of that section, which distrusted the Northern commercial interests; and as Washington, he was the idol of the masses everywhere. Furthermore, the very basis of the election had cut the ground from under the chief opposition party. The overshadowing issue, almost the only one, of the Confederation,— which had no president nor regular elections, but only scattering "by-elections" of Congressmen,— was whether it should be replaced by a stronger government; the adoption of the Constitution had settled that, and the Anti-Federalists were shut down to voting for the personnel to administer a system they disliked and dreaded. Besides this, all their ablest sympathizers were Federalists for the time being, not from love of a strong government but experience of too weak a one; so that "Federalist" for election purposes meant not so much a party as almost every one in the country of capacity, experience, or business or intellectual standing.

1792.— Again Washington was the unanimous candidate. The same men substantially were sent to Congress; indeed, there were few Anti-Federalists to send who would not discredit and weaken the cause. But the Anti-Federalist voters had the less hesitation, because their natural leaders had now begun to split away and lay the foundations of the Democratic-Republican party. Jefferson was the first to take a stand against the Federalist policy, in the matter of the Bank; shortly reinforced by Madison and Edward Randolph.

1796.— Washington, who could have held the office for life, refused it further. There was now a contest over policies represented by candidates identified with them, and each representing a section as well: John Adams stood for the Northern commercial States, with most to lose from conflicting local impositions on commerce, or foreign depredations and restrictions which a weak government could not repel; Jefferson, the lifelong champion of the extreme democratic principle,— the least government, the cheapest, and the most unshowy, possible,— stood for the mass of farmers, largely in the South and West, who simply wished to be let alone and have no taxes, and thought commerce of no benefit or concern to them. The latter also formed a part of the rapidly growing mass who resented the Federalist claim that political office needed any superior ability or training, and were eager to pass it around in rotation. Quite as strong as either was the sympathy of the masses for the French Revolution, which the Federalists detested. The latter won, but only by grace of two Southern electors and in reality by a single vote; they lost save for these the entire South beyond Maryland, and all but one electoral vote of Pennsylvania as well. In a word, the party had represented a temporary national necessity which was ceasing to be imperative, and a minority business interest; and as the former vanished, it was shrinking to the basis of the latter.

1800.— For the personal feuds which rent the Federalists in twain, see ADAMS, JOHN, and HAMILTON, ALEXANDER; but the influence of these in defeating the party is always overrated. If Hamilton had loved Adams like a brother, and all Adams' Cabinet had been loyal and united, the general result of the election would not have been different; unless we are to suppose that New York Federalists voted for Jefferson because their chiefs hated each other, or that the party's recent policy had gained it votes since 1796, which is notoriously the reverse of truth. It had not only angered the Democrats, but displeased many of its own moderates, by the Alien Law for deporting all foreigners politically disagreeable to it, and the Sedition Law to shut the mouths of its opponents (see ALIEN and SEDITION LAWS); the Hamilton wing had tried to force through a war with France to strengthen its domestic policy; the growing popular sentiment now was to make the United States a political island, severed from all relations with the rest of the world which would cause us difficulties. The election was decided for Jefferson by the reversal of New York's 12 electoral votes: local feuds had something to do with it, Burr's political "bossship" much; but beyond all, the growth of the country was away from Federalism, and at best the party had not one electoral vote to lose without being displaced.

1804.— Had the relations of the parties remained the same as in 1800, there is still no reason to think there would have been any return to a Federalist administration. From 1789 to 1797 their program had been not merely the best, but the only one as a whole possessing either utility, dignity or even safety; yet the disintegrating forces were so strong, and the squalor of the Confederation so thoroughly forgotten, that the party barely escaped expulsion in the very prime of its usefulness. Even in the next four years, its errors were trivial compared with its services, especially in creating the navy; yet it was beaten — not very heavily, but with incidents proving that its lost sections would not come back to it. But so far from the issues remaining the same, the Federalist representatives, with that egregious blindness to the sources of popular strength which is never seen except in "practical politicians," committed the amazing folly of attempting to tie their opponents' hands by borrowing all their discarded doctrines. The Democrats in power had at once become converts to a strong government and a liberal construction of the Constitution;

the Federalists, instead of outdoing them and claiming support as the originators of the policy, adopted the strict-construction theories and the decentralizing policy of their opponents. The Democrats having appropriated the Federalists' strength, the latter revenged themselves by appropriating their enemies' weakness. This was especially glaring in the case of the Louisiana Purchase, an extreme Federalist measure, and by far the greatest title of Jefferson to the name of statesman: it is quite incredible that the Federalists should have opposed this, even as partisans, or as possessing the rudiments of political commonsense. Their astute policy received its fitting reward; in 1800 Jefferson had won by 73 to 65; in 1804 he received 162 to 14.

1808.— The Democrats, having had full power to put in force their cherished theories of insularity and independence of international ties, at once proceeded to make a *reductio ad absurdum* of them, and hang them like a sack of stones about their town necks. Jefferson was placed between the upper millstone of the English right of search and impressment, ending in the bloody outrage of the Leopard on the Chesapeake (q.v.), and the nether of his own resolve not to fight, the disbelief of all parties alike in our ability to fight a naval war with England, and the determination of the North, which possessed most of the fighting resources, not to use them against England. He solved the problem by the Embargo (q.v.), which saved the need of fighting by sacrificing the commerce he did not value, and the prosperity of a section he was quite resigned to see unprosperous. The moribund Federalist party gained a galvanic life from this, which for the time looked like a real one: in 1804 it had carried only Connecticut and Delaware and part of Maryland; in 1808 it carried all New England but Vermont (the one State which had no commerce to lose), three votes from North Carolina and Delaware, and the two Marylanders as before,— 47 in all.

1812.— The same causes which had operated during the previous four years had continued with ever-growing efficacy during this four. The feeling against England among the Democrats, the feeling among the Federalists that England was fighting the world's battle against Napoleon and must not be crippled, ever grew in intensity; the misery and hate in New England with its hamstrung commerce kept pace with either; a generation of youths was growing up who never saw the Revolution,— The War of 1812 was officially determined by four Southerners between 26 and 29; and the conquest of Canada, instead of a naval war where it was universally believed our entire fleet would be at once seized and impressed into the British navy, had struck the war party as a happy resource. The political campaign of 1812 was made on the issue of war or a repeal of the Non-Intercourse Act. Madison was given a second term on the express condition of his approving the war; he detested it as strongly as Jefferson, but as the majority had its teeth set, felt that he might as well head it as anyone else. He secured it by 189 to 89; the Federalists by a fusion had carried, besides their old States, New York and New Jersey and more of Maryland. A new era seemed coming for the Federalists; but it was an illusion. They had no party principles, and not even a party candidate except a borrowed one (George Clinton); and their entire basis of life now was on an issue by its nature temporary.

1816–20.— The close of the War of 1812 extinguished the old issues. The mostly inglorious land war had been forgotten in the blaze of New Orleans; we had proved that our navy not only could fight the queen of the world on equal terms, but would never again be wantonly defied; the people were full of satisfaction at coming out so well, and of anger at the Federalists, whose chief section had carried opposition to the point of discussing secession. Federalism was in many minds tainted with treason. Furthermore, the New England capital driven out of commerce by the embargo and the war had begun to re-embark in manufacturing, wished for a protective tariff, and could only have it from the governing element, which was hopelessly Democratic. Rhode Island, the first to establish mills, was the first of the Southern tier to break away from its old allegiance. Massachusetts, Connecticut and Delaware, by small majorities, clung to the ancient faith; but in 1816 the Democrats carried 16 States with 183 votes, including the rest of New England. The government had bid for these votes by a United States Bank and a light protective tariff; and in 1820, the "Era of Good Feeling," or rather of "No Issues," Monroe was elected unanimously save for the vote of one elector, disgusted with the business "rings" growing up around the administration.

1824.— The administration still further carried out Federalist ideas by a great system of internal improvements and by strengthening the tariff. In a word, while nominally Democratic-Republican, its policy had become so Federalized as to have a stronger hold on its new allies than on its old constituents, and the issue in 1824 was whether that policy should be sustained or reversed. John Quincy Adams and Henry Clay represented the former, in different sections; Andrew Jackson the reaction to old-fashioned Democracy, with strict construction, economy and no intermeddling with business development; William H. Crawford the regular Democratic "machine," with no ulterior purpose but office. Thus divided, no candidate had a majority. Jackson had the most; Adams was elected by the House of Representatives, still so far dominated by educated politics as to consider Jackson an ignorant and pestilent demagogue; he made Clay — who had the lowest vote of the four, but was the Southern leader most in accord with his policy and the most of a statesman — Secretary of State. This "Coalition" (q.v., No. 2) was denounced by the enraged Jacksonites as a corrupt bargain, and the House election as defeating the people's will; but there is no reason for assuming, as is currently done, that the anger gained Jackson any electoral votes.

1828.— The Democratic reaction had gained strength and the Jackson enthusiasm swept all the factions into his fold, by virtue of the State conventions which had now assumed the office of nominating. On that side the issue was much more Jackson than any definite party program; but Jackson as representing the hatred of the masses, especially the Southern and Western masses, for the "money power," for all

activities of government beyond keeping itself alive, for tariffs and government subventions, and for all claim of superiority in the educated class and all political initiative except by spontaneous popular movements. In short, Jackson was the agent of a Democratic revolution, which supported him with a swarm of new men and approved his policy of turning out the trained officials neck and heels. Adams held his vote well; the stock reasons for his defeat — his ungraciousness, his refusal to employ patronage, his revival of charges against the New England Federalists — are absurd in face of the fact that he had but one vote less than in 1824 and of Jackson's enormous plurality. No candidate representing trained statesmanship, culture and a liberal government policy, could have won this election.

1832.— The Democratic tide swept on overwhelmingly. Jackson's unprecedented use of the veto power to defeat internal-improvement schemes voted for by members of his own party only bound the majority more tightly to him; his war against South Carolina for attempted nullification cost him her votes, but brought him reinforcements from the nationalist section; his hostility to the Bank of the United States was a prominent issue in the canvass, and was that of his constituents. Nothing better proves the senselessness of accounting for great political results by personal factions or squabbles than the fact that Adams in 1824 and 1828 had more electoral votes than all Jackson's opponents together in 1832.

1836.— The issues of this year were the carrying on of Jackson's policy, though its great objects had been accomplished,— the deposits had been placed in State "pet banks" instead of the United States Bank,— and his dictation of his own successor. To oppose this dictation, one party sprung up with the ardent Jacksonian Hugh L. White as nominee, another as a Georgia State Rights faction,— though Jackson had championed the Georgia rights in the matter at issue (see CHEROKEE CASE); Jackson's influence, however, was powerful enough to nominate Van Buren as the "regular" candidate and he was elected by a much reduced vote from Jackson's.

1840.— Few men have had a worse legacy than Van Buren received in the Presidency; and few have made a better use of it. Almost his entire term was occupied by the panic of 1837 and the three years of hard times which succeeded it; caused entirely by Jackson's "monkeying" with the currency of which he knew nothing. The State banks which replaced the United States Bank as depositaries and were used as Democratic political machinery, instead of managing the funds with discretion as the old bank had done, issued masses of notes till a tremendous inflation of the currency had created a vast land speculation; then he suddenly withdrew recognition of the paper currency and brought the whole structure down with a crash. Van Buren was a politician, but he was a sound statesman and financier and an honorable public man; he would have no more meddling by the government with the banking business for which he was unfit, even to extricate his own administration from a scrape; and after three years' struggle he established the Sub-Treasury system, to the lasting benefit of the country. But with the customary popular perspicacity, he was made the scapegoat for calamities which he had not caused and whose renewal he had prevented. Furthermore, the Whigs outbid the Democrats in avowed submission to the "popular mandate," their candidate Harrison promising to disuse the veto; they outdid them in the "popular hero" line by turning a useful but not very brilliant Indian battle into a second Marathon, or rather repeating the name without discussing the details; capped their swarms of mythical anecdotes of Jackson's homespun habits and unpretentious heroism by an equal number about Harrison, models of his hypothetical "log cabin" and bibulous reproduction of his "hard cider" days; they made bargains and absorbed both the Southern free-lance opposition parties; and by all this and their campaign "noise, numbers and nonsense," carried all but three old States and four small new ones, 234 to 60 — a majority which suggests that possibly the noise and nonsense were not needed nor efficacious, and a quieter campaign of sensible argument might equally have won, with a real leader like Clay and no ruinous bargains.

1844.— Harrison had barely survived his inauguration; and the usual policy of "placating" the strongest part of the opposition by giving them the Vice-Presidency (Tyler) had produced its usual and deserved fruit of turning the administration over for the whole four years to the Nullification party, except so far as the Whigs tied its hands. This under Clay's leadership they did, consolidating the party by steady war on Tyler, and heartening themselves at last to do what they had not before and did but once again — put forth a platform. It was a very compact and well-expressed one, excellent from the Whig or present Republican standpoint; but it was displaced as an issue by far more exigent and pungent practical ones. The tariff of 1842, which was almost weeded of protectionist features by the joint efforts of Tyler and the Democrats, was made one of the arguments; but the decisive one was Texas. For years the great object of the Calhoun wing of the Democrats had been to annex Texas; partly to increase slave territory and balance Northern growth, partly with the immediate aim of disrupting the Whig party by forcing it to take a position which would drive away either the Northern or the Southern wing. Tyler, deprived of Whig support, again drew near to the Calhoun party to which he had formerly belonged; in 1844 Calhoun was made Secretary of State; and with this administration backing, the Calhoun party obtained control of the Democratic national convention, committed it to Texas annexation and gave the nomination to the Southerner Polk instead of the Northerner Van Buren. Clay was asked to declare himself on this point; he wrote an evasive letter which cost him the support of the political abolitionists (see LIBERTY PARTY), who nominated a ticket of their own with disastrous results to both. The three tickets were those of Polk, Clay and Birney; the first on the issues of protection, distribution of land sales, cutting down Presidential power and dodging all phases of the slavery question; the second on the "reoccupation of Oregon and the reannexation of Texas"; the third on immediate abolition of slavery. The last-named cast only 62,300 votes; but enough of those were in New

York and Michigan to turn the former's 35 and the latter's 6 electoral votes from Clay to Polk, electing the latter, bringing in Texas and bringing on the Mexican War.

1848.— The Mexican War had been the dominant issue for a couple of years before, and the Democrats had striven to make it destructive to the Whigs by forcing them into obnoxious declarations of principle; but the latter voted supplies for it and evaded abstract pronouncements as to its righteousness. The Wilmot Proviso (q.v.) was a heavier blow, for the Southerners looked on it as a primary touchstone of sectional loyalty, which stood above party loyalty. The one salvation was a popular moderate candidate who could be accepted by the voters to whom the Democrats were simply impossible; and such a one was found in Gen. Zachary Taylor. A Louisiana slaveholder, no Southerner could suppose he would sign a bill endangering his own property; known to dislike the veto, he could be trusted by the North to obey the verdict of Congress if it passed the Proviso; a popular hero, he commanded the great unreflecting brute vote which supposes military and civil functions somehow related. He was elected by reason of a split in the New York Democracy, the country being about evenly divided; that he was elected at all, however, is remarkable proof of the terror of the conservative masses at having the slavery firebrand thrown into politics. It was this vote which elected the Whigs Clay and Taylor (the former really elected so far as the Democratic competitor went), and the Democrats Pierce and Buchanan, each in the hope of suppressing the question altogether.

1852.— Taylor died in 16 months and the Vice-President, Fillmore, completed the term; but all through the four years each of the two parties of unlimited slavery extension and slavery restriction was drawing its ranks together and forming into the parties soon to contest the final mastery. In place of Whig and Democrat, it was increasingly North and South. Unfortunately, the South was willing to fight and the North as yet was not; and the so-called Compromise of 1850, like most compromises, was practically all on one side, the Northern Whigs letting the measure go by default. They did not like it, but the South insisted and they had much more confidence in placating their own constituents for adhering to it than the South for not doing so; once passed, therefore, they proclaimed it a sacred and irrepealable decision, as being a "compromise," and the Fugitive Slave part as being a sacred obligation to uphold. As always, the "reopening of agitation" was executed by the Southern wing; before the Presidential nominations were made, they had determined to force the Whigs to an absolute declaration of party policy, a touchstone of legitimate membership. First at the Whig caucus of 20 April, then at the Baltimore national convention of 16 June, they insisted on the party recognizing the Compromise as a finality; in the platform, the last article, of great length and minuteness, made the Fugitive Slave Law, by name, a part of the organic constitution of the party. This was death, and the Southern Whigs must have so intended it. General Scott, as a military hero, was made the candidate. The Southern Whigs, instead of voting for him on account of the Fugitive Slave plank, largely voted against him because the anti-slavery men in the convention, for no assignable reason, had voted for him, and he was said to be partial to Seward; the Northern Whigs largely voted against the platform and the Whigs carried only four States, Massachusetts, Vermont, Kentucky and Tennessee, and less than a third of the next Congress even nominally, a third even of that being Southerners who soon became Democrats. The Whig party was no more; "died of an attempt to swallow the Fugitive Slave Law" was the epitaph proposed for it.

FORREST MORGAN,
Connecticut Historical Society.

AMERICAN POLITICAL ISSUES, 1865-1918. Reconstruction.— The predominating question that presented itself for settlement in the years immediately succeeding the Civil War was Reconstruction, or the conditions under which the seceded States should be readmitted into the Union. Reconstruction was not officially complete until 1870, when Georgia, the last State to be restored to the Union, was readmitted; scarcely any other question was considered during the administration of President Johnson. But although, technically, the Southern States were restored to self-government, and the two administrations of General Grant saw vigorous military force employed to control the complexities of an anomalous situation, it was not until the middle of President Hayes' administration, or 13 years after the war closed, that an end was finally put to Federal interference in the local concerns of the Southern States. See UNITED STATES — RECONSTRUCTION IN THE.

Rise of New Parties.— During the first administration of President Grant steps were taken toward the reform of the civil service, March 1871. It was about this time that the Prohibitionists first put a national ticket in the field, and this period was noted also for the appearance of organized labor in the arena of national politics by the formation of a Labor-Reform party. A Liberal Republican party was also formed, and the decadence of old issues and use of new ones was graphically indicated by the fact that there were five party tickets in the field in the election of 1872. The formation of this Liberal Republican party, which chose Horace Greeley as its standard bearer, should receive further notice, for it dominated political formations and alignments, down to 1892. It took with it many of the great abolition leaders of the old Republican party — men like Sumner and Phillips who claimed that the old party no longer stood for the principles from which it had gained its strength and life. These men were the predecessors of the later Independents and Mugwumps. These recalcitrants were met halfway by the Democratic party, that made haste to drop the old Doughface and Copperhead issues and catch-words, and nominated their bitterest foe because he seemed to impersonate the Republican revolt. The immediate result was defeat, but it led to the Tilden victory (or near-victory, according to the point of view) in 1876 and the election of Cleveland in 1884, and definitely committed the Democratic party to an attitude that faced the future instead of the past.

The "Grangers" and the Money Question.— The seething process was still going on, for from 1872 the genesis of at least two new issues appeared; one was the «Granger» movement, which, though primarily organized to promote co-operative buying and selling and securing laws favorable to the farming classes, became the seed, which flowered later, of attempts, not always well advised, to curb railroads and trusts and prevent discrimination in rates and prices. Another great issue to assume large importance at this time was that of national finances. Occasioned by the terrible panic of 1873, and by a supposed public demand that gold should be used only to pay the interest on the national debt, a «Greenback» party was organized in 1874 which took part in the three following national elections, and, under the name of the Greenback-Labor party, polled more than a million votes in the congressional elections of 1878; and in that year silver was made legal tender and given limited coinage. But in 1874 President Grant vetoed the «Inflation Bill» which would have added $44,000,000 to the currency; and on 7 Jan. 1879, in President Hayes' administration, specie payments were resumed after a suspension of 17 years, and greenbacks have ever since been payable in gold on demand.

The Civil Service.— The assassination of President Garfield led to a radical reform in the civil service. The vicious system taken over by Jackson from that of New York— classic in Marcy's sentence, «To the victors belong the spoils,» had become so deeply rooted that perhaps nothing less than the martyrdom of a President could have effected a change in public policy at this period. But on 1 Jan. 1883, the «Pendleton Bill» provided a constitutional, practical and effective measure for the remedy of the abuse known as the «spoils system.» Many States have enacted laws along the same lines, and the classified lists of those subject to civil service examinations have been increased by the executive orders of successive Presidents, until, on 30 June 1915, of 476,363 officers and employees of the Federal civil service 292,296 held positions subject to competitive examinations under civil service rules; and the practice of levying assessments for partisan purposes has long since been discountenanced by law.

Anti-Chinese Legislation.— Anti-Chinese feeling on the Pacific coast made it necessary in 1876 for both great parties to insert anti-Chinese planks in their platforms. A bill to restrict Chinese immigration was passed in 1879, but was vetoed by President Hayes because it violated the Treaty of 1868. In 1880 a new treaty was negotiated with China, under which the United States was to regulate, but not to prohibit absolutely the entrance of Chinese. The limitation was to apply to Chinese laborers only. An act of 1882 suspended the immigration of Chinese laborers for 10 years. This act was amended in 1888 to prohibit the return of Chinamen once here who went back to China. A treaty pending with China at this time was denied ratification by the latter because of the amendment. In 1892 the Act of 1882 expired and a new law was passed continuing the exclusion for a further period of 10 years. In 1902 an act was passed continuing existing legislation until further enactment should be made and extending the exclusion laws to the island possessions and forbidding the migration to the mainland or to other island groups of Chinese domiciled in one group. See CHINESE IMMIGRATION.

Railroad and Commerce Regulation.— It was during President Cleveland's first administration, 1887, that the first great measure looking to the regulation of railroad and commercial interests was passed — the Interstate Commerce Act (see COMMERCE, INTERSTATE); this was amended in 1893 by the Elkins Act, which omitted the penalty of imprisonment. The original act was amended in a drastic way in 1910, the Elkins Act being left in force. The amendment is known as the Mann-Elkins Amendment to the Act to Regulate Commerce. It contains 24 sections, which specify the companies and organizations subject to the Act, and forbidding discrimination, rebates and preferences of all kinds. For a summary of its provisions see RAILWAYS — GOVERNMENT REGULATION OF. An Interstate Commerce Court was established in 1910 to hear appeals from decisions of the Interstate Commerce Commission. See INTERSTATE COMMERCE COMMISSION; UNITED STATES COMMERCE COURT; TRUSTS.

Formation of Other Parties.— It was at about this time, which seems to have been one of great political initiative, that (1888) two new Labor parties appeared, Union Labor and United Labor; and in the next presidential election (1892) the Socialist Labor party and People's party or «Populists» were born. The Populists demanded the free and unlimited coinage of silver; national ownership of all public means of communication and transportation; a graduated income tax; popular election of United States Senators; and, it is interesting to note, the adoption of the initiative and referendum (q.v.). Many of these measures have since been brought into prominence by the Socialists or have been adopted into the platforms of one or both of the greater parties. The Populists were also pioneers in denouncing the imperialistic policy of the government in 1900. In 1892 they polled over a million votes and in the two following elections fused with the Democrats (See IMPERIALISM). To indicate still further the political restlessness of this period we may recall the fact in 1896 there were seven parties in the field and, in 1900, eight. The Socialists had now divided, or increased, into two parties, of which the new one was to prove the stronger. In the election of 1900 it polled nearly three times as many votes as the Socialist-Labor party; by 1908 it had 30 times as many votes. In 1912 it was again 30 times greater than the older party, but in 1916 it received almost 50 times as many votes, although it polled only 59 per cent of its 1912 vote and the Socialist Labor party only 32 per cent.

The Tariff.— This question was brought to the front during Arthur's administration in 1882. The clamor against the exorbitant rates had been so vociferous that the President appointed a commission to report on conditions. The commission, manifestly partisan in its personnel, was expected to «stand pat» and report against lowering the tariff; but they astounded the country by recommending a 20 per cent reduction through the entire list. Congress,

however, calmly ordered an increase of 10 per cent and there the subject rested, if the country didn't, until the famous "Tariff Message" of President Cleveland in 1887. The burden of this message was that the existing tariff was the cause of burdensome taxation which could be relieved only by a reduction of the duties on raw materials, especially wool.

The resulting Mills Bill failed to pass the Republican Senate but, in 1890, under President Harrison, the McKinley Act was passed which raised, instead of lowered, the duties on most articles. In 1894, under President Cleveland's second administration, the Wilson Bill became law, its principal feature being free admission of wool. In 1897, under President McKinley, came the Dingley Act; the duty was again imposed on wool and other rates were advanced. In 1909, under President Taft, the Payne-Aldrich Tariff Act was passed with no general lowering of the tariff wall. A tariff board was created not only to secure information on the maximum and minimum provisions of successive tariff bills but upon the relative costs of production at home and abroad.

The Payne-Aldrich Tariff of 1909, which was so irregular and unscientific that President Taft had hesitated to sign it, although he afterward held it to be "the best tariff that the country had ever known," was also assailed by President Wilson. Four other bills for tariff reform passed by Democrats and Progressives had been vetoed by President Taft. These now paved the way for the Underwood Tariff Act which became law 3 Oct. 1913, and fixed a high rate on luxuries and a low revenue rate on the necessities of life. The results were unfortunate; duties were so lowered that the customs receipts fell off $26,000,000 in the following year. Further depression was caused by the outbreak of the European War in 1914 which upset all calculations. On the revival of business in 1915–16, while the Republican party stood firm for a protective tariff, less was heard about a general revision, and more about certain changes of detail. A Tariff Commission was created by the General Revenue Act of 1916, to consist of six members. It is the duty of the Commission to investigate the administrative, fiscal and industrial effects of the tariff laws. The free-sugar clause of the Underwood Tariff Act was repealed in 1916.

In conjunction with President Taft's tariff policy, an attempt was made in 1911 to crown previous reciprocity arrangements with different countries by a Canadian Reciprocity Agreement. This was designed to secure admission into the United States of Canadian agricultural products in return for the repeal of Canadian duties, such as wheat and other grains, fresh fruits and vegetables, dairy products, fish, eggs, poultry, cattle, sheep and other live animals, on American cotton-seed, fruit, etc., with reduced rates on agricultural implements and other manufactured articles. This bill was passed by Congress but rejected by the Canadians in a special election.

The previous reciprocity agreements referred to were: First, one with Canada in 1854, which lasted for 12 years. Its provisions as regards Canada were almost identical with those of 1911, except that manufactured articles were not included — only raw materials which both countries produced. It is curious that the objections to it in England and Canada were almost exactly identical to those heard later, viz.: The fear that the United States was attempting to weaken the bonds between England and Canada with a view to annexation of the latter to her neighbor on the south. In 1875 a reciprocity treaty was made with Hawaii, admitting Hawaiian sugar, duty free, in return for a long list of manufactured articles. This treaty remained in force until the annexation of Hawaii in 1898. Under the terms of the McKinley Bill in 1890 reciprocity treaties were made with Germany, Austria and several South American countries, but these were repealed by the Wilson Bill in 1894. See UNITED STATES — RECIPROCITY; UNITED STATES — HISTORY OF THE TARIFF.

Foreign Relations.— It is necessary to go back to the administration of President Harrison to note the first real growth of public interest in the foreign relations of the United States, both commercially and diplomatically. The meeting of the Pan-American Congress (q.v.) in Washington in 1889, for which the far-seeing statesmanship of James G. Blaine must receive most of the credit, did much to prepare the way for commercial reciprocity and for a more liberal attitude toward the outside world. This event marked the first entrance of the United States into world politics since 1815. Before that its keenest interest had been in foreign affairs, as became a satellite of its mother; since then the outside world was almost forgotten except when certain portions of it were menaced as in the Civil War. It was in 1889 that we strode into the world arena once more but under widely different auspices; for there followed the Expansion Period, the creditable part borne by the United States in the Boxer troubles in China, the "Open-Door" policy of Secretary Hay, the successful offices of President Roosevelt in establishing peace between Japan and Russia and other notable evidences that the United States had at last taken her place as a "world power." See UNITED STATES — TERRITORIAL EXPANSION; UNITED STATES — COMMERCIAL DEVELOPMENT.

Anti-Trust Legislation.— The Sherman Anti-Trust Act of 1890 had led to a number of secret agreements between interested parties which sought to evade the provisions of the act, while still dominating the various markets. When Colonel Roosevelt became President, he resolutely instituted an investigation of these evils, and in 1903 the Attorney-General was instructed to bring suit to dissolve the recently-formed Northern Securities Company, as a combination in restraint of trade with interests which would permit the control of the nation's railways passing into the hands of three or four persons. In 1904 the combination was declared illegal by the Supreme Court. The Railway Rate Regulation Act of 1906 made concessions to the railroads, but President Roosevelt's attitude antagonized large banking, corporation and other commercial interests. Under President Taft, regulation of railways and corporations was not favorably looked upon, and this with further leniency toward moneyed interests, led to the formation of the Progressive Republican party, which joined with the Democrats,

when opportunity offered, to promote legislation favorable to their views. This movement created opposition, led by ex-President Roosevelt, to President Taft's re-election. The result was a Democratic party victory with the election of Woodrow Wilson by a minority vote — 2,500,000 less than the combined votes of his Republican opponents. President Wilson was not in sympathy with consolidated business interests, which he described as "so great that it is almost an open question whether the government of the United States can dominate them or not," and he proposed that Congress should pass new laws curbing monopoly. In 1914, the Rayburn Bill, an anti-stock watering measure, was introduced and passed the House, but was stopped in the Senate as it was discovered that the financial condition of railroads made it inadvisable to press further legislation. The Federal Trade Commission Bill and the Clayton Anti-Trust Act, however, became law; the first to deal with corporations not engaged in transportation but carrying on interstate business or with a foreign country; the second to meet difficulties that had arisen through efforts of corporations to create monopolies by indirect dealing, such as offering their products at special low prices until their competitors were driven out of business.

Income Tax.— When in 1895 the Supreme Court set aside the Income Tax Law of the previous year, on the ground that it was a direct tax, and therefore must be apportioned among the States according to population, an amendment to the Federal Constitution seemed the only remedy. On recommendation of President Taft, both Houses of Congress, with almost no opposition, submitted such an amendment to the States in 1909, allowing an income tax without proportional distribution. It was ratified by the necessary 36 States — to which six others were promptly added — and became a part of the Constitution, 25 Feb. 1913.

Senatorial Election by Popular Vote.— During the first decade of the 20th century there was constant agitation for an amendment providing that senators should be elected by popular vote. Such an amendment was submitted 15 May 1912 and it went through with such rapidity that it was put in force 31 May 1913. From that time all vacancies as they occurred were filled by popular election. The result was that many senators who had never been chosen to any office by popular vote found that they could not meet that test and dropped out. By 4 March 1919, this amendment had its full effect, every senator thereafter being chosen by direct popular vote.

Liquor Legislation.— In recent years the liquor question has grown into an issue of vast national importance. Prohibition and local option have made great strides across the continent, though it cannot be said that the consumption of intoxicating beverages has fallen off in proportion, the per capita figures for 1916 being slightly greater than those for 1902. Whereas prior to 1 Jan. 1915 there were only nine States which had adopted prohibition, on 1 March 1917 there were 25 States on the "dry" list, with an aggregate population of 35,380,568 (1910 census). In 19 States prohibition laws were effective while in the other six the law became operative at different dates during 1917 and 1918. Hence it was estimated at the time that more than 55,000,000 of the population of the United States were living under prohibition and more than 60 per cent of the entire area of the nation was prohibition territory. In the Presidential election of 1916 the Prohibitionist candidate, Mr. J. F. Hanly of Missouri, received little over 221,000 votes, about 13,000 more than the candidate in the previous (1912) election, but considerably less than were obtained by the Prohibition candidates in the elections of 1888, 1892, 1904 and 1908. But if the party prohibitionists were not supported in the popular voting, their cause was greatly advanced in the referendum voting on liquor laws and prohibition amendments. Though the joint resolution providing for the submission of a prohibitory amendment to the Constitution was not voted upon during the 64th Congress, the consideration which was given the measure in both Houses indicated a strong sentiment in its favor. Enormous changes were wrought by the Food Control Act of 1917 as a war measure, and further modifications were introduced by the November elections of that year. See LIQUOR LEGISLATION: PROHIBITION.

Woman Suffrage.— The issue of votes for women made large advances between 1913 and 1917. It was one of the most widely discussed questions in the range of popular government. By 1916 women voted on equal terms with men at all elections in 11 States and one Territory, Alaska; partial suffrage existed (1917) in six other States. An amendment to the Federal Constitution, Article II, to strike out the word "male" was defeated on 12 Jan. 1915 by a majority of 204 to 174 in the House of Representatives. In Indiana a suffrage bill passed 22 Feb. 1917 was declared unconstitutional and void 17 September. The campaign of 1915 in the three great Eastern States, New York, Massachusetts and New Jersey, was defeated by large majorities. The elections of 1917 revealed a great surprise when New York State declared for suffrage by a majority of 100,000 votes, to which the city of New York contributed a considerable portion, after having given nearly a 90,000 majority against it two years before. This brought the number of complete suffrage States to 12. According to statistics compiled by the officials of the National Woman Suffrage headquarters in November 1917 there were (together with New York) 10,121,931 women in the United States who may vote in Presidential elections, of which number 5,759,021 may vote on all issues. Total number of States, 19. On 4 March 1917 the first lady "congressman" took her seat in the American legislature. After sweeping the State in the primaries in August 1916, Miss Jeanette Rankin was elected (November 1916), as one of the two congressmen-at-large from the State of Montana. See WOMAN SUFFRAGE.

GEORGE EDWIN RINES.

AMERICAN PRINTING TRADE. See PRINTING TRADE, AMERICAN.

AMERICAN PROTECTIVE ASSOCIATION, or **"A. P. A.,"** a secret order organized throughout the United States and Canada. Its

chief doctrine, as announced in its declaration of principle, is that "subjection to and support of any ecclesiastical power not created and controlled by American citizens, and which claims equal, if not greater, sovereignty than the government of the United States of America, is irreconcilable with American citizenship"; and it accordingly opposes "the holding of offices in national, State, or municipal government by any subject or supporter of such ecclesiastical power." Another of its purposes is to prevent all public encouragement and support of sectarian schools. It does not constitute a separate political party, but seeks to control existing parties and to elect friendly and defeat objectionable candidates by the concerted action of citizens affiliated with all parties, much after the style of the American or "Know-Nothing" party. The order was founded 13 March 1887 and once claimed a membership of over 2,000,000.

AMERICAN PSYCHOLOGICAL ASSOCIATION, a society founded in 1892 for the advancement of psychology as a science. Persons are eligible to membership who are engaged in this work. Membership, 227. Office of secretary, Smith College, Northampton, Mass.

AMERICAN PUBLISHING. See PUBLISHING, AMERICAN.

AMERICAN QUARRYING. See QUARRYING.

AMERICAN RAILROADS. See AMERICAN STREET RAILWAYS; RAILWAY SYSTEMS IN THE UNITED STATES.

AMERICAN REPUBLICS, Bureau of. See PAN-AMERICAN UNION.

AMERICAN REVOLUTION. See UNITED STATES — AMERICAN REVOLUTION.

AMERICAN RIVER, in north-central California, is formed by the union of its northern and southern forks near the western boundary of the county of El Dorado, whence it flows southwest between the counties of Placer and Sacramento and falls into Sacramento River near the city of Sacramento. For about six miles it has been rendered navigable for small steamers. The north fork, considered by some as the true American River, rises among the hills at the base of the Sierra Nevada, flows west-southwest, forming the boundaries between Placer and El Dorado counties for 100 miles, and unites with the south fork 30 miles above the city of Sacramento. The south fork flows from Bonpland Lake through El Dorado County and forms part of the division between the counties of Sacramento and El Dorado.

AMERICAN-SCANDINAVIAN FOUNDATION, The. The foundation was incorporated in 1911 under the laws of New York with the object of cultivating closer intellectual relations between the Scandinavian countries and America and strengthening the friendly bonds between American-Scandinavians. It was endowed by the late Niels Poulson, president of the Hecla Iron Works in Brooklyn, himself of Danish birth. The income from one-half million dollars is administered by a self-perpetuating board of 15 trustees. The Foundation maintains an office with a salaried secretary and staff and an organization of associates numbering upward of 4,000. It awards annually six fellowships to Scandinavians for study in the United States and a number of scholarships to Americans for research work in Scandinavia. It publishes regularly two series of books, 'The Scandinavian Classics' and 'The Scandinavian Monographs,' and a bimonthly illustrated magazine, *The American-Scandinavian Review.* Address, 25 West 45th Street, New York.

AMERICAN SCENIC AND HISTORIC PRESERVATION SOCIETY. A national organization of men and women incorporated by the legislature of the State of New York in 1895. Its aims are the protection of natural scenery, the preservation of historic landmarks and the improvement of cities. In pursuance of these objects it is empowered to receive by purchase, gift or otherwise, and to hold in fee or trust, real or personal property necessary thereto; and it is required to make to the legislature an annual report of its affairs. Among its activities since its foundation have been the following: The purchase of the New York State Park at Stony Point, and of Washington's headquarters in New York city, the creation of a State reservation at Watkins Glen, laws for the protection of Niagara Falls, acquiring the site of Major André's execution; and it has charge of Fort Brewerton, and Philipse Manor Hall.

AMERICAN SCHOOLS OF LAW. See LAW, AMERICAN SCHOOLS OF.

AMERICAN SCULPTURE, Historical Subjects in. American art in the Colonial and Revolutionary periods was confined chiefly to portrait painting. At the beginning of the 19th century there was to all practical purposes no such thing as an art of sculpture in the United States. Mural painting, as a branch of art adapted especially for depicting historical subjects, was still farther away in the future. The country was not ready for the development of art along the lines of history and commemoration of historical characters. It was not until the latter half of the 19th century that there began to be real activity on such lines.

At first, when statues or busts of pioneers and patriots began to be in demand for public institutions or places, notably the national capitol at Washington, it was customary to go abroad to find some artist, possibly a Frenchman or Englishman, capable of doing the work. And when there began to be Americans of real talent who devoted themselves to sculpture they at first were chiefly absorbed in producing gods and goddesses of Greece and Rome, more or less poor imitations of those of classic times, rather than in creating things having to do with their own country and its annals and customs. It is chiefly in the past 25 or 30 years that American sculptors have found their main inspiration in national subjects and have devoted themselves so largely to themes associated more or less directly with American history.

A great influence upon this phase of American art has been exercised by the wars of the nation, chiefly the Revolution and the Civil War, while the recent centenary of the War of 1812 and the close of a century of peace with Great Britain witnessed the dedication of a strikingly large number of works of art having to do with

AMERICAN SCULPTURE

1 George Rogers Clark (By Elsie Ward)
2 Sieur de La Salle (By L. A. Gudebrod)
3 Gen. Alexander Maccomb (By A. A. Weinman)
4 Pere Marquette (By Cyrus E. Dallin)

AMERICAN SCULPTURE

1 John Paul Jones Hoisting the American Flag on the *Ranger*. (Sculptural Relief by Niehaus)
2 Francis Scott Key Monument, Baltimore. By Niehaus
3 Lafayette and His Servitor, Prospect Park, Brooklyn, N. Y. By Daniel C. French

this commemoration and furnishing proof of the good effect of such celebrations and the incidents recalled upon contemporary art.

Another influence which should be noted is that of the great international expositions of the last quarter century. Most of them had some historical motives which have been expressed in the architectural schemes and in the decorative features, and the latter, while usually temporary, have exerted a powerful and far-reaching force, affecting public taste in many ways and often leading to more permanent decorations of similar type in connection with public places and institutions. Hence there has been, partly as a result of the influence emanating from these expositions, a marked increase in the application of the art of the sculptor to the embellishment of buildings like capitols, court-houses, libraries and even business structures of a semi-public character. There have arisen within this period the Congressional Library at Washington, one of the most interesting and educational buildings in the world, in its artistic features, so largely associated with historical characters or subjects; the Pennsylvania State capitol at Harrisburg, with its sculptures by George Grey Barnard, historic or symbolic of national types; the Court-house at Baltimore, with its many excellent decorations; the Appellate Court Building in New York, with its sculptures typical of law and government; the New York Custom House, with its façade figures by Daniel Chester French and others; the State capitols of Wisconsin and Iowa, with their splendid adornments typical of the spirit of the West; the Jefferson Memorial Building at Saint Louis, an outcome of the Louisiana Purchase Exposition, with its imposing group by the late Karl Bitter showing Marbois, Livingston and Monroe signing the Louisiana Purchase Treaty; and the statue, also by Bitter, of Thomas Jefferson, during whose administration this momentous purchase was negotiated; and the Cleveland Court-house, with its historical sculpture, including Chief Justice Marshall by Herbert Adams.

The artistic merits of the creations of later years in this field are evident from a comparison between them and earlier efforts of similar type. When the Virginia assembly wished to have a statue of Washington erected at the State capitol there was apparently no American sculptor equal to the task, and Jean Antoine Houdon (q.v.), the French sculptor, was engaged to model one. He came to this country in 1785 for the purpose, and the statue, the original of which is now in the capitol at Richmond, was dedicated in 1788. Another French sculptor, David d'Angers, executed the first statue which was made of Jefferson. By 1832, when the centenary of the birth of Washington was observed, Horatio Greenough, Thomas Crawford and Henry Kirke Brown were coming upon the scene. Greenough was then but 27 and studying in Florence, Italy, but Congress commissioned him to execute a statue of Washington, stipulating that it should not be equestrian and that the countenance should correspond to that of the Houdon Washington. Greenough devoted the greater part of eight years to his commission and received $20,000 for his work, quite a sum in those days. The statue, which is of Carrara marble, was brought from Italy in a special ship. It represents the First President in bare legs and a Roman toga, which has slipped from his shoulders, lifting a finger of warning and advice to the nation. It is in the nature of a characterization of him as an Olympian Zeus. It was recently removed from the square in front of the capitol to the Smithsonian Institution. There has been much controversy over this figure and no little ridicule has been cast upon it. Considering the time and circumstances it was no doubt a work of merit but does not, in spite of the classic atmosphere with which it is supposed to be invested, give us that impression of dignity and intellectual force in the Father of his Country which we associate, for instance, with John Q. A. Ward's fine figure of the same statesman in front of the Sub-Treasury in Wall Street, New York, or the splendid equestrian statue by Daniel Chester French in Paris, France, or Henry Kirke Brown's equestrian statue in Union Square, New York. The latter may be classed among the earlier examples of American historical sculpture, but holds its own in spite of the onward march of artistic standards. Another historical work, also by Brown, is the spirited statue of Gen. Winfield Scott in Scott Circle, Washington, D. C. Launt Thompson was another of the early American sculptors who did meritorious historical work. His statue of General Scott at the Soldiers' Home, Washington, is an example. Thomas Ball was another. His equestrian statue of Washington is in Boston Common. Clark Mills executed equestrian statues of Andrew Jackson and George Washington which are famous. The national capital has the original of his Jackson and New Orleans a replica.

The historical work of the earliest American sculptors consisted almost entirely of sculpture in the round — statues and busts. The idea of portraying historical subjects in reliefs, upon the bases of monuments, or upon panels in doors or upon the walls of buildings, though familiar abroad, was a later development in American art. Perhaps one of the first examples of it was the work of Thomas Crawford. Crawford was one of the pioneers of American sculpture and famous for his statuary in ideal subjects. But he did much of the earlier sculpture of the national capitol illustrating American history and was the sculptor of the bronze doors opening from the Senate portico of the capitol. Its eight panels illustrate such subjects as the "Death of Warren at Bunker Hill," "Washington's Rebuke of General Charles Lee at Monmouth," "Hamilton's Gallantry at Yorktown," "Washington's Reception at Trenton" and his first inauguration. Crawford designed the House portico doors and Rinehard modeled them. Hiram Powers' groups in the Senate portico are a notable feature of the decorations of the capitol and illustrate "American Development and the Decadence of the Indian Race."

Statuary Hall at the capitol is notable for its historical associations, containing reminders in its gallery of portrait sculptures, by many artists, and some more or less crude and archaic, of the men and women who from the very beginnings of the nation have been the makers of its history. In the decorations of the Congressional Library history and allegory

are so intimately mingled that it is hard to draw the line between them. The wealth of adornment runs the gamut of archæology, history, mythology, allegory, poetry, music, the drama and the arts, but in the statues and busts, the bas-reliefs and medallions, mosaic work, etc., one finds a multitude of records in art of the men and women who founded the nation or guided it upon its destiny.

Revolutionary characters and episodes have been most fruitful in recent years in inspiration to the sculptors. This is owing to many causes but not a little to the work of the patriotic societies, which have been untiring in their study of the period and zealous in efforts to keep green the memory of American warriors and statesmen. Numerous tablets commemorating Revolutionary incidents have been dedicated, some containing sculptural reliefs more or less elaborate, and some statues of Revolutionary characters are traceable to such influences, an example being the figure of Nathan Hale, the Patriot Spy, by Frederic MacMonnies, in City Hall Park, New York, dedicated in 1893, erected by the Society of Sons of the Revolution in the State of New York. This figure, which is superb as a work of art, is scarcely so truthful a portrayal of Hale, however, as are the statues of him executed recently by William Ordway Partridge and Bela L. Pratt, which are the result of very careful historical study. One of Mr. Partridge's Hale figures stands in a park in Saint Paul, Minn., and is the gift of the local Nathan Hale Chapter of the Daughters of the American Revolution. Another is in Washington, D. C. Mr. Pratt's work is on the Yale campus at New Haven, Conn., opposite the room Hale occupied as a student at Yale, and was placed there in 1914.

On the Columbia University campus, New York, is Partridge's statue of Hale's friend and fellow officer in the Revolutionary army, Alexander Hamilton, which was recently dedicated. Within the same period, through the efforts of the Sons of the Revolution and Daughters of the American Revolution, one of Long Island's Revolutionary heroes, Gen. Nathaniel Woodhull, president of the Provincial Congress of New York, who was fatally and brutally assaulted by the British near Jamaica, L. I., because he would not say "God save the King," has received sculptural honors, including a fine bronze tablet by Albert Weinert picturing the incident of the attack upon him by the enemy. A movement is in progress at this writing to erect a statue and monument to the principal hero of the battle of Long Island, Gen. Lord Alexander Stirling. The deeds of his command, a militia regiment of Marylanders, are commemorated in a monument in Prospect Park, Brooklyn, but there is as yet no adequate memorial to Stirling though it was largely because of his gallantry in engagements of this battle that the American army was saved from complete destruction and Washington was enabled to make his masterly retreat afterward to New York.

Lafayette, too, has been honored by the dedication of a monument to him at the Ninth Street entrance to Prospect Park, Brooklyn, in May 1917, on which occasion Joffre, Marshal of France and hero of the battle of the Marne, was the guest of honor. A citizen of Brooklyn, the late Henry Marteau, left $35,000 for this purpose and the commission for the execution of the work was awarded to Daniel Chester French, who completed the model on Lafayette's birthday, 6 Sept. 1916. Many regard it as one of the finest things that have come from Mr. French's studio. The monument symbolizes Franco-American unity, past, present and to come. It embraces a number of features, the central one of which is a bronze tablet upon which in bold relief the sculptor has portrayed Lafayette standing by his horse which is held by an aide. Lafayette wears the uniform of a general of the Continental Army. His drawn sword is in his right hand and his left reposes upon his hip. On each side are accessories relating to the hero's career which round out the composition as a whole.

To the Revolutionary period belong also Mr. French's "The Minute Man," at Concord; the group at Princeton, N. J., by MacMonnies, commemorating the turning of the tide of the Revolution in the battle of Princeton, won by the Americans; C. A. Heber's portrait statue of Franklin, at Princeton; the equestrian statue of Gen. Anthony Wayne at Valley Forge, Pa., by H. K. Bush-Brown, and H. K. Brown's equestrian of Gen. Nathaniel Greene at Washington, while to this and the period immediately succeeding belong Miss Helen Farnsworth Mears' portrait bust in Milwaukee of the soldier and pioneer, Gen. George Rogers Clark, a notable example of historical sculpture by an American woman and a gift of the Society of Children of the Revolution.

The placing of tablets or other forms of memorial marking the scenes of Revolutionary incidents has occurred chiefly, of course, in the vicinity of such battlegrounds and in some cases restoration of the redoubts and fortifications where famous episodes of war transpired has been attempted and tablets, often of considerable artistic merit, have been erected. A case worthy of mention is the restoration of Fort Ticonderoga which has been done at great expense and with high regard for the artistic character of the historical markers.

The monuments and other works of the nature of sculpture occasioned by the centenary of the War of 1812 were wholly or in part the outcome of celebrations like the Oliver Hazard Perry Centennial in Ohio, Pennsylvania and New York in 1913, the "Star Spangled Banner" Centennial at Baltimore in 1914, the centenary of the battles of Plattsburg and Lake Champlain in the same year, the pageant at New Orleans in 1915 in honor of Andrew Jackson's great victory over the British a hundred years before, and the commemoration at the Jefferson Memorial, Saint Louis, in February 1915, of the centenary of the ratification of the Treaty of Ghent. As a result of or in connection with such incidents we have the splendid memorial at Put-in-Bay, Ohio, in honor of the heroes of the battle of Lake Erie and the bronze statue of Perry himself; the Perry monument at Buffalo by Charles H. Niehaus; the statue of Gen. Alexander Macomb at Detroit by A. A. Weinmann; the bas-relief in honor of the heroes and pioneers of the 1812 period at the Jefferson Memorial, Saint Louis, by R. P. Bringhurst and Mary E. DeGarmo; the Malmette monument at New Orleans and the Francis Scott Key Memorial

AMERICAN SCULPTURE

1 The Buffalo Dance. By John H. Borglum
2 Louisiana Purchase Treaty Group. By Karl Bitter. (Marbois, Livingston and Monroe signing Treaty)
3 Statue of Thomas Jefferson. By Karl Bitter. (University of Virginia)

at Baltimore, designed by Niehaus, and but recently finished.

The Hudson-Fulton celebration in New York State in 1909 and the Champlain Tercentenary in New York State and Vermont in about the same period furnished occasion for some records in art of characters and events commemorated, including a monument to Champlain with sculpture by C. A. Heber.

The Mexican War provided the motives for comparatively few notable works of sculpture aside from statues of generals like Winfield Scott who belong also to other periods of history. Among works of recent date associated with the history of this war is a relief at the National Museum, Washington, by Isidore Konti, picturing the incident of Kit Carson, the scout, and Edward F. Beale, afterward a general, hailing Commodore Stockton's flagship at the conclusion of their adventurous trip through the desert and the Mexican lines to bring news of re-enforcements to the beleaguered Americans. Kit Carson has also been pictured in a group by Augustus Lukeman and F. G. R. Roth showing the scout mounted and in picturesque pose and costume. It is at Trinidad, Col.

The Civil War has occasioned more historical and commemorative art projects than any other event in the nation's history, not even excepting the Revolution. Some of these achievements are crude, or at least archaic, as viewed from the art standpoint, yet are the outcome of a national impulse in which patriotic sentiments were mingled with artistic ambition. And while there may be a degree of monotony in the long list of statues of heroes of that period, there are not a few which rise above the mediocre in conception and execution and form noble and enduring achievements,—landmarks by which the progress of the nation in its æsthetic development may be noted. This is particularly true of the equestrian statues, which are often instinct with life and action. The finest example, no doubt, is the statue of Gen. William Tecumseh Sherman by the late Augustus Saint Gaudens at the Fifth Avenue entrance to Central Park, New York, which many regard as the noblest product of his remarkable genius. On the other hand, while the patriotic instinct has found its most frequent expression in this connection in the erection of statues of individual soldiers like Grant and Sherman and Lee and Sheridan and naval officers like Farragut, some of these memorials have taken the form of groups and reliefs in which a greater range has been afforded the artist's imagination. An instance in which there is dramatic character in superlative degree is the artillery group done recently by Henry M. Shrady for the splendid Grant monument at Washington, D. C. Mr. Shrady's equestrian statue of Grant for the same memorial should also be mentioned. Herman A. MacNeil's Soldiers and Sailors' Memorial at Albany, N. Y., is an instance of a composition in which a very poetic scheme has been carried out and which conforms remarkably to artistic requirements. A man of the extraordinary genius of Saint Gaudens was very naturally called upon frequently during that period of his career falling from 10 to 30 years after the Civil War for the performance of tasks associated with it, and beside his Sherman monument special mention should be made of another of his great works occasioned by it, the Shaw Monument on Boston Common, one of the most famous and meritorious of all American achievements of the kind, and his statue of Admiral Farragut, Madison Square, New York, with its sculptured pedestal. Reference may also be made in speaking briefly of the best known of such works to MacMonnies' equestrian statue of Gen. George B. McClellan, Gutzon Borglum's equestrian figure of Gen. Philip H. Sheridan, both at Washington, and the equestrian statue by Niehaus of Gen. Nathan B. Forrest at Memphis, Tenn., all of which stand out as especially fine examples of such work.

It is the heroes of the army who for obvious reasons furnish the subject for equestrian groups, but the navy, too, has been productive of characters and episodes suitable for the themes of the sculptor. In its very infancy the American Navy produced a John Paul Jones, and one of the most significant and striking episodes of recent years was the finding of his body and the movement resulting in its being brought from France and placed within a splendid memorial erected for the purpose at the Naval Academy at Annapolis, Md., and containing reliefs by Miss Evelyn B. Longman signalizing his achievements. The movement was stimulated by romances and plays appearing just before this in which he figured as hero. There is further commemoration of his gallantry in the reliefs by Niehaus for the monument at the entrance to Potomac Park, Washington.

That it is not always possible or desirable to classify a work of art having historical associations with one period alone of the nation's history is illustrated in the case of some of these well-known figures of the Revolutionary and pioneer periods and that of 1812. Gen. Winfield Scott, for instance, whose picturesque personality is perpetuated by so many sculptural works, was perhaps most conspicuous as a military chieftain during the Mexican War, but he began his career with very gallant exploits in the War of 1812 which have been commemorated in art and survived to participate in the defense of the nation at the outbreak of the Civil War. He is seen on horseback, in a statue by F. E. Elwell, on the battlefield of Gettysburg.

Nor have the heroes of the Confederacy been forgotten, or the women who made sacrifices for the "Lost Cause." Recently there was dedicated at Raleigh, N. C., a group by Augustus Lukeman in honor of the "Women of the Confederacy," while Gen. John B. Gordon is commemorated in an equestrian statue at Atlanta by Solon H. Borglum. Jefferson Davis, President of the Confederacy, is portrayed by Edward Valentine in an emotional rôle, pleading for his cause, one hand outstretched in gesture and the other resting upon the open book of history. The figure is half encircled by a colonnade and may be seen at Richmond, Va. Here, too, is a fine bronze equestrial figure of Gen. J. E. B. Stuart, the Confederate cavalry leader, the work of Frederick Moynihan. The gallant military leader of the Confederacy, Gen. Robert E. Lee, became president, after laying down his arms, of Washington and Lee University at Lexington,

Va., and here he is memorialized in a meritorious recumbent statue by Valentine, while there is also on the field of Gettysburg a memorial of him, and at Richmond, Va., in the Capitol Square there stands an equestrian figure surmounting a massive pedestal, the sculptor being Mercie. Lee's remains rest in a vault under the statue of him at Washington and Lee University.

Wendell Phillips, the great Abolitionist leader, is the subject of a recent work by French, forming a fine example of the art of this distinguished American sculptor, while one of the best known and justly famous of J. Q. A. Ward's achievements was his statue of the eloquent Abolitionist preacher, Henry Ward Beecher, in front of Brooklyn's Borough Hall. In another statue of Beecher in Brooklyn, placed not long since in the arcade between Plymouth Church and the Arbuckle Memorial Building, and the work of Gutzon Borglum, his character is further interpreted in an interesting way. It emphasizes his services as prophet-reformer and the slave girls at his side recall the scenes when he sold slaves in Plymouth Church at auction to obtain their freedom and aroused national protest against slavery. The work represents him at the height of a splendid maturity, possessing both the vigor of youth and the dignity of middle age.

Nor should the sculpture signalizing the services of the man who fought so forcefully with his pen for the cause of the Union, Horace Greeley, be forgotten. A seated figure in bronze was long in front of the office of his newspaper, the New York *Tribune,* and was recently removed a short distance away, while at Chappaqua, N. Y., where he had a farm, a fine standing figure by Partridge was not long since dedicated through the efforts of the Greeley Memorial Association.

The Spanish War gave us the Dewey Arch on Fifth Avenue, New York, with its emblematic sculpture by many of the leading men in that branch of art in the United States, and though it was but a temporary achievement, it pointed the way to others more permanent. Later French and Andrew O'Connor collaborated in the strong figure at Indianapolis of General Lawton, who fell in the Philippines.

After the assassination and death of President McKinley at the Pan-American Exposition in 1901 the nation was moved as by one impulse to do honor to his memory through some of the forms of art. There resulted the noble McKinley Monument at Buffalo, with its lions by A. Phimister Proctor at the four corners, the imposing mausoleum at Canton, Ohio, with its statue and accessory sculpture by Niehaus, the Columbus, Ohio, Memorial by H. A. MacNeil, that in Fairmount Park, Philadelphia, by C. A. Lopez and Isidore Konti, and many others, while at Niles, Ohio, the birthplace of McKinley, there has just been erected (1917) a most unique patriotic shrine and museum, wherein McKinley relics may find a safe and available place of custody in an architectural and sculptural setting noble in conception and appropriate in details of execution. The architects of the memorial are McKim, Mead and White and the sculptor J. Massey Rhind, New York. The building itself is of Georgia marble and in the centre is a court of honor supported by 28 monolothic columns. In front of this court is a statute of the dead President, and the colonnade contains busts of members of his cabinet and others associated with his administration, while in the relic rooms, library and auditorium are works of art forming tributes to the heroism of those who participated in the Civil and Spanish-American wars. It is described as "not simply a monument, not simply a memorial building, but both and more."

Memorial buildings bearing the name of Lincoln are now in progress of creation or have recently been dedicated, and the sculpture in which his features are preserved is plentiful throughout the land, the works by Saint Gaudens, Gutzon Borglum, Niehaus and MacNeil being of special merit; and that by George Grey Barnard, having been a subject recently of much controversy, both highly praised and severely criticized.

In recent years the most important work of an historical nature, whether in painting or sculpture, has been done upon commission in the decoration of public buildings like some of those mentioned. Thus, instead of isolated works there result mural paintings in logical series, in panels or other architectural features of the edifice, or reliefs and tablets or sculpture in the round, all having an artistic and historical relation, often portraying episodes in the development of nation or commonwealth, like the work of Miss Violet Oakley and George Grey Barnard for the Pennsylvania State capitol. Often it is difficult to draw lines between work that is mainly decorative and that which is primarily historical. In general historical art has a decorative motive. This is especially true in the case of exposition sculpture, of which much that was worthy of preservation has been done. This applies to such achievements as Solon Borglum's picturesque figure of "The American Pioneer" for the recent Panama–Pacific Exposition at San Francisco; to Cyrus E. Dallin's splendid Indian types in sculpture, some originally executed for exposition adornment; to Albert Weinert's "Primitive Man" and MacNeil's "Adventurous Bowman," at the San Francisco Exposition, and works there by Calder and Aitken, and others. At several of the expositions notable attention has been given in the decorative sculpture to the portrayal of the American Indian and such work has much historical value. H. K. Bush-Brown's superb model of the "Buffalo Hunt," representing an Indian on horseback attacking a buffalo, was accorded the place of honor at the Jamestown Exposition. Dallin, whose fame rests largely on his depiction of Indian subjects, has contributed much work of the kind to expositions and this has resulted in commissions for permanent groups like his "The Appeal to the Great Spirit" in Boston, and "The Signal of Peace," Chicago. Edwin Willard Deming is also a valuable contributor to such records of the Red Man, and though his art has been applied mainly in the direction of painting, it includes some interesting Indian sculpture. Some of the most striking of MacNeil's early successes were his "The Sun Vow," "The Last Act of the Moqui Snake Dance" and "Welcoming the White Man," a group for the city park of Portland, Ore., commemorating the arrival of the white men of the Lewis and Clark expedition on the shores of the Pacific.

There are Indian figures also in Mr. MacNeil's reliefs for the Marquette Building, Chicago, showing scenes in the life of the hero-priest, Father Marquette. Frederic Remington's cowboy types are graphic portrayals of a picturesque period now vanishing, like that of the Indian, one of them being his "Cow Boy" in Philadelphia, while cowboys, Indians and pioneers have been the themes inspiring Solon Borglum's most original work, work that is typically American. In all such art there is historical as well as decorative motive and the influence that flows from it is educational and patriotic, even though it is imparted without the conscious effort of the beholder and the artistic emotion seems to be the predominating one. See SCULPTURE IN THE UNITED STATES.

EDWARD HALE BRUSH.

AMERICAN SHIPBUILDING. See SHIPBUILDING, AMERICAN.

AMERICAN SILKWORM. See SILKWORM.

AMERICAN SOCIAL SCIENCE ASSOCIATION. See SOCIAL SCIENCE ASSOCIATION, AMERICAN.

AMERICAN SOCIETY OF CIVIL ENGINEERS, an association organized 5 Nov. 1852, in the city of New York, its object being the professional improvement of its members, the encouragement of social intercourse among men of practical science, the advancement of engineering in its several branches, and of architecture, and the establishment of a central point of reference and union for its members. Among the means to be employed for attaining these ends are periodical meetings for the reading of professional papers and the discussion of scientific subjects, the foundation of a library, the collection of maps, drawings and models, and the publication of such parts of the proceedings as may be deemed expedient.

The early life of the society was a struggle for existence and it was not until 1867 that the organization had a permanent headquarters and began its work in earnest. The first publication was the address of President James P. Kirkwood, delivered 4 Dec. 1867, and printed in Vol. I of 'Transactions' bearing date of 1872. The first annual convention was held in New York 16 June 1869, 55 members being present. The second and third conventions were also held in New York, but the fourth was held in Chicago and the annual conventions are now held at widely separated points. In 1869 the membership of the society was 160; the membership in 1916 was about 8,000. The society has a splendid library of over 85,000 volumes, thoroughly classified and indexed and which is kept up to date by new additions. A monthly publication of *Proceedings* is issued in which are printed the professional papers in advance of their presentation at the semi-monthly meetings. These papers with all the discussion to which they give rise, are subsequently printed in 'Transactions,' two and sometimes three volumes of which are issued annually. The society owns its house at 220 West 57th Street and has no debt.

The organization is in no sense a local one, and it has 15 local associations of its members, located in the larger cities of the United States. Its membership is made up of practitioners engaged in all branches of civil engineering, the broadest interpretation of that term being used. From the beginning, admission to its privileges has been dependent solely upon professional experience and personal character.

That the society is beneficial to the profession is evidenced by the eagerness with which membership in it is sought. The reasons for this are apparent, inasmuch as among its objects are to assist the young engineer professionally during the earlier years of his career, and, when he has proved himself worthy, to stamp him as one qualified to direct "the great sources of power in nature for the use and convenience of man." That its influence is far-reaching is shown by the fact that it has members in 51 of the 54 subdivisions of the United States, as well as in 46 foreign countries. This foreign membership constitutes 9½ per cent of the total list.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS, a professional organization composed of engineers practising principally in the department of generation, distribution and utilization of mechanical power and the processes of manufacture by mechanical processes. It is one of four organizations of engineers, national in its character and with a considerable foreign membership also, which exists for the purpose of the reading and discussion and publication of papers on engineering subjects and for the advancement of the profession of engineering in any direction within its scope.

The society was formed in 1880 by a group of persons in and near New York city, who recognized that the existing societies of mining and civil engineers did not naturally and instinctively offer a scope for the developing strength of mechanical engineering in the United States. Its first meeting was held in New York city in the autumn of 1880. Since that two meetings have been held each year; the annual meeting in the city of New York and other meetings in various cities of the Union; meetings have fallen in Boston, Providence, Philadelphia, Altoona, Buffalo, Pittsburgh, Cleveland, Minneapolis, New Orleans, Indianapolis, Nashville, Richmond, Saint Louis, Chicago, Washington and San Francisco. These meetings last three or four days and are always made the occasion of visits to important engineering enterprises in the city which is entertaining the society. Usually from 15 to 20 papers are read and discussed at each of these meetings and the papers with their discussions are issued to all members in the form of an annual volume, averaging a thousand pages and copiously illustrated. These volumes which are designated 'Transactions' are an accumulation of most valuable professional literature, results of tests and experiments, researches into new fields and are filled with recorded data of observation. The society was incorporated as a national organization under the laws of New York State in 1881 and has maintained its executive offices in New York city. For seven or eight years its headquarters were in office buildings in the business district, but in 1889 the movement was started of having its library of professional literature open in the evenings and for this purpose the society rented quarters in the Mott Memorial Library Building, Madi-

son Avenue near 27th Street. The success of the evening opening of its library warranted the step which was taken in 1890 of purchasing the property which had been altered by the New York Academy of Medicine for this purpose and which included not only a library space and equipment, but a convenient auditorium of small size for the holding of meetings. The society later became a participant in the provision of a wealthy engineer and donor whereby three of these national societies are accommodated in a special building designed specifically for the needs of organizations of this class at 29 West 39th Street.

In addition to the publication of an annual volume the society issues a monthly periodical called *The Journal* of the society, which contains current professional literature of a high order and full abstracts of similar material from foreign societies and journals. It also conducts a free public reference library of engineering. This library is particularly rich in the current contributions to other scientific and engineering societies both in English and in other languages and in periodical literature published through the journals of technical journalism, both at home and abroad. This class of literature is of special significance in lines in which progress is as rapid as in the industrial departments of engineering. The library contains (1917) over 60,000 books and 10,000 pamphlets. It has also a valuable collection by bequest of antiquities in engineering and scientific matters, and obtains by exchange the scientific publications of the United States government and corresponds with the important technical societies of Europe and the continent. The cozy auditorium and the library exhibit much material in portraits, busts and memorials of engineering achievement. It is specially rich in drawings and other documents belonging to the work and history of Robert Fulton and early steam navigation.

The society has also discharged a valuable function by the service of professional committees on special subjects. These professional committees have mainly been concerned with the work of formulating the best procedure in various lines, with a view of having such procedure a species of standard whereby uniformity might be secured. Committees of the society have reported on uniform methods for conducting tests of boilers, on uniform methods of conducting tests of engines, on uniform standards in structural material, and have prosecuted research on the fire-resisting properties of material, advisable methods for conducting tests of strength, and similar problems. These reports are made by the best experts connected with the society, and while the society officially never adopts their recommendation by legislative action, these recommendations carry great weight by reason of the sources from which they come. The society is governed by a council, consisting of a president, six vice-presidents, nine managers, a secretary and a treasurer. A recent achievement in this field has been a code of accepted practice in design and operation of steam-boilers; and another has been a standardization of proportions of flanges for joints in pipe. It has been active in the movement to conserve the natural industrial resources of the country.

AMERICAN STATE GOVERNMENT. See STATE GOVERNMENT, AMERICAN.

AMERICAN STREET RAILWAYS. The idea of the street railway grew out of the steam railroad agitation when the first steam railroad was built in the United States in 1829. This idea rapidly materialized and the first street railway was built in New York city in 1832, the tracks being laid on the Bowery and Fourth Avenue from Prince Street to Harlem, the rail consisting of strips of flat-iron laid on granite blocks. This railway was put into operation in June 1833, the first cars running from Prince Street to Murray Hill. The cars resembled the stage coach then in use and were mounted on flanged wheels. This road being a financial failure, it was not until 1836 that the next street railway was built in Boston. After this time street railways were built in all large American cities and between 1860 and 1880 the horse railway had become an established institution. As cities grew and distances within their limits became longer there was created a need of a motive power to propel the cars faster than horses could draw them. In some cases steam locomotives were used in the suburbs of large cities, but this was considered objectionable on account of the noise, dirt and danger.

Numerous systems of propulsion were proposed and large expenditures were made in tests and trials. The first practicable method found was that of drawing the cars by an endless wire cable and this method was first used in San Francisco in 1873 with much satisfaction where it was well suited for roads with heavy traffic and steep grades. This system was used in nearly all the large cities during the next 15 years, but as the cost was over $100,000 a mile, only the largest cities could make it profitable. It was soon conceded, however, that the cable system was not the ideal one for moving cars as there were certain mechanical difficulties in its operation which were extremely burdensome, and experiments were continued with other systems between 1880 and 1890, mainly with electric motors. The names of Edison, Field and Thomson are identified with this work. The first electric line in the United States was an exhibit run by Van Depoele at the Chicago Industrial Exposition in 1882–83. In 1884 Henry in Kansas City, Mo., and Bentley and Knight in Cleveland, Ohio, constructed and operated electric lines. The first street railway to be entirely equipped with electric cars and successfully and continuously operated was a road 12 miles long in Richmond, Va., built in 1888 by Frank J. Sprague, called the «father» of the electric street railway. As soon as this road demonstrated that the electric motor could propel street cars reliably and economically, horse roads all over the United States were changed to electric roads, and many new roads and extensions were built into the suburbs of the great cities.

The electric railway, a distinctly American institution, was soon introduced all over the world. In the United States in 1912 there were 41,065 miles of electric railway track, covering an investment of $4,596,563,292, employing 282,461 persons and daily transporting about 33,250,000 people. Besides the 76,162 cars de-

voted to the transportation of passengers, there were 7,794 express and freight cars, mail cars, parlor cars, and even funeral cars on the street railways of American cities. Interurban electric railways have been built in the outskirts of the large cities and between towns on a large scale and there are now very few towns of more than 5,000 inhabitants which are not connected with their neighbors by means of an electric railway. The total car mileage in 1912 was 1,921,620,074, operated by 3,665,051 horsepower of which 471,307 horse-power was produced by water-power and the remainder mostly by steam. Of the total track mileage, 38,958 miles were operated by overhead trolley; 1,395 miles by third rail; 352 miles (in New York city and Washington) by conduit trolley; 65 miles by storage battery; 76 miles by steam; 58 miles by horses; and 56 miles by cable. Of the whole mileage, 40,532 were on the surface; 420 miles were elevated; and 113 miles were in subway and tunnel. The gross income for the years 1912 was $585,930,517; the operating expenses were $332,896,346; and the net income was $61,910,753.

In 1915 approximately 1,044 miles were added to the electric-railway mileage of the United States, as compared with 946 in 1914. Of the total added in 1915, 596 miles represented new electric-railway track built, and 448 miles electrified steam mileage. According to the *Electric Railway Journal* the total electric-railway mileage of the United States in 1916 was approximately 46,454 miles; and the electric-railway companies operated 99.405 cars and locomotives. There were 1,027 companies operating the total mileage of 46,454, with 98,893 cars and 512 electric locomotives. Complete data of electric-railway earnings are not currently available, the latest detailed and complete statistics being those of 1912 as furnished above.

Many problems in electricity have arisen in the development of the street railway, the latest of which is the question of the alternating current. It is readily seen that an alternating current system of electric traction which would permit the use of a high transmission line potential and avoid the transformation to direct current by means of the rotary converter would give an impetus to the electrical solution of transportation problems greater even than that which followed the introduction of the rotary converter. The direct current, because of its limitation as to voltage, is inadequate as a system for the distributing of power over a wide area. The alternating current system, permitting a change of potential by means of the simple and efficient static transformer, has already successfully met the requirements of transmission and distribution of electric power. The necessity of using direct current for the operation of cars has, however, greatly restricted its application to general railway service, involving, as it does, the introduction of the rotary converter with its auxiliary apparatus, increasing the cost both of installation and operation and reducing the commercial efficiency of the system as a whole. However, the direct current was in use in 1916 on nearly all city lines and on a large proportion of the interurban lines. The city lines are operated at 500 or 600 volts and the suburban lines at from 1,200 to 1,500 volts. It is claimed for the alternating current system that it saves 20 per cent in power required. The cars, however, are more expensive and this tends to offset the cheaper equipment required in alternating sub-stations.

Catenary line construction is intended for high tension trolley roads, operated at potentials up to 6,000 volts or more. It is especially designed for use in conjunction with single phase alternating current railway equipment and marks one step further in the movement to secure a greater degree of economy and efficiency in the operation of electric trolley lines. The employment of high tension currents for traction purposes necessitates the use of an improved trolley equipment possessing an efficiency and a reliability of a high order. The speed attained upon interurban lines makes it difficult to obtain satisfactory service with a trolley wire which dips between supports and sags and sways with every impulse. Increased precautions against accidents and faulty construction are also necessary because of the increased liability of damage from any diversion of the line current from its proper channel. Study of the traffic reports of many roads has shown that the passenger traffic to be expected on street railways in the United States ranges from 70 rides (fares) per capita per year in cities of 15,000 population, to 240 fares per capita in cities of 1,000,000 population. The intermediate figures are: 120 fares per capita in cities of 50,000 population; 150 fares to each of 100,000 population; 180 fares to each of 200,000 population; 210 fares to each of 300,000 population; 220 to each of 500,000 population.

In late years there has been a rapidly increasing demand for a controlling system applicable to trains of motor cars as well as to cars operated singly. This demand has been met by the development of the unit switch system of multiple control, which consists of a skillful combination of electro-magnetic and pneumatic devices, each applied to those operations in which experience has shown it to be most effective. The construction is noticeable for the liberal design of its working parts and contacts and the great margin of power available for their operation; while the general design and simplicity of operation insures great reliability of service and low cost of maintenance. See STREET RAILWAYS.

For extended discussion of technical and operating problems, consult Bureau of the Census Bulletin 124; Austin's 'Single Phase Electric Railways' (1915); Harding's 'Electric Railway Engineering' (1916); Norris's 'Electric Railways' (1913); Smith's 'Electric Traction' (1905).

AMERICAN SUGAR REFINING COMPANY, The, an organization which, since 1900, holds a dominant position in the sugar industry. It was formed by the consolidation of the Havemeyer and other interests into one group. It operates five large refineries in the United States, at Chalmette, La., Brooklyn, N. Y., Jersey City, N. J., Boston, Mass., and Philadelphia, Pa. The first three of these are the largest plants of their kind in the world. The real estate and plants, including refineries, warehouses, cooperage, railroads, tank cars, wharves and stables, with their machinery and

equipment and timber and other lands owned in fee or through ownership of the entire capital stock of constituent companies, are valued at $47,246,442. The total assets of the company on 31 Dec. 1916 aggregated $129,979,775; the capital stock on the same date consisted of $45,000,000 preferred and $45,000,000 common. In 1916 the profit from its operations totalled $9,756,379, the interest on loans and deposits $792,990, the income from investments reached $2,905,737, and the total dividends declared during the year amounted to $6,299,972.

AMERICAN SUNDAY-SCHOOL UNION, a religious association having for its object the organization and support of Sunday-schools in needy neighborhoods, or those where religious sentiment is too divided to sustain denominational ones; the publication and circulation of moral and religious publications and the dissemination of useful information. It is not a union of churches but of Christians of various denominations, requiring no common creed but a belief in the essential truths of Christianity held in common by all evangelical denominations and a desire to save souls and «teach the truths that Christ taught as plainly as He taught them.» The members of the society may be either clergymen or laymen, every citizen of the United States who contributes $3 annually and is approved by the board being eligible, but its affairs are directed by a board of officers and 36 mangers, all of whom must be laymen. The managers are elected by the members and the former annually elect the officers. There are also four standing committees appointed by the board, namely, publication, missions, finance and executive. During 90 years of work it has had for presidents,—Alexander Henry, John McLean, John A. Brown, Robert L. Kennedy, William Strong and Morris K. Jesup and the present president, Martin L. Finckel. Its headquarters are at Philadelphia, where it first came into being. Its germ was the First-Day Society, founded in 1791, whose managers petitioned for free schools in Pennsylvania; this led to the formation of the Philadelphia Sunday and Adult School Union in 1817 which later united with similar societies and changed its name to the present title in 1824. The second year of its existence the Union printed an average of 90,000 pages per day besides periodicals and over 600,000 Scripture tickets; since then its progress in every field of endeavor has been very rapid. It introduced the first selected uniform lessons — for which graded instruction was later provided — and the system known as «Union Questions.» It trained innumerable teachers and maintained missionaries to organize schools throughout the West and South, particularly in the Mississippi Valley, and later in foreign lands. To supply literature to these schools which became the nuclei of thousands of churches, it created the first juvenile literature of a moral and religious type; stimulating the use of music in Sunday schools; organized a $12,000 American Missionary campaign; founded the first weekly Sunday School Teacher's Journal; proposed the first National Sunday School Convention in America; issued the first $10 libraries of 100 volumes for Sunday schools and distributed millions of dollars worth of literature including Bibles and Testaments. In the last 25 years (1890–1915) the society has organized 43,509 new schools, having 169,016 teachers and 1,503,975 pupils besides reorganizing or reviving 9,000 other schools. Its missionaries have increased forty-fold. By 1897 all debts had been paid and the society placed on a firm financial basis. Its income-bearing funds and property now amount to about $2,000,000. It expends $225,000 annually in missionary work. Publications are furnished at cost but several thousand dollars worth of free literature is annually distributed in homes, hospitals, reformatories, etc. Consult 'Encyclopædia of Sunday Schools' (New York 1915).

AMERICAN SYCAMORE. See PLANE.

AMERICAN TEXTILE INDUSTRY. See TEXTILE INDUSTRY, AMERICAN.

AMERICAN TRACT SOCIETY, The. This society was organized in New York city on 11 May 1825. Its work is interdenominational and international in scope, and is commended by all evangelical denominations. The design of its founders was to establish a central society for the whole Union, inviting the co-operation of Christians of all the Protestant churches, and of other tract associations as auxiliaries, in publishing and circulating whatever would best diffuse a knowledge of Christ as the Redeemer and promote the interests of true religion and sound morality. The society has published the Gospel message in 178 languages, dialects and characters. It has carried on an important work among the foreign-speaking people in the United States, and its missionary colporteurs are distributing Christian literature in 33 languages among the immigrants, and making a house-to-house visitation among the spiritually destitute, both in the cities and rural districts, leaving all kinds of Christian literature in the home. During the past 75 years the society's colporteurs have made 18,612,843 family visits, in the course of which they have distributed 17,382,454 volumes. The total number of titles of distinct publications, aside from periodicals, that have been issued from the society's home office is 9,136. The grand total of its publications, including tracts, books and periodicals, issued from the home office during the past 91 years, is 794,639,700 copies. In Spanish and Portuguese the society has issued 14,748,588 copies of volumes, tracts and periodicals, including 126,000 Spanish hymnals. For Latin-America 14,748,588 copies of volumes, tracts and periodicals have been issued, amounting in value to $633,545. For publishing Christian literature in foreign lands the society has forwarded cash appropriations to the amount of $799,456.39, and has granted electrotypes to the value of $61,177.96, making a total expenditure of $860,634.35, by means of which many million copies of books and tracts have been published at mission stations abroad. During 1915 the society gave away Christian literature to the value of $16,684.99. The grand total value of its gratuitous distribution is $2,634,505.89, which is the equivalent of 5,269,010,000 tract pages. Grants of its publications are given to missionaries, army and navy chaplains, pastors and Christian workers of every description. The society publishes four periodicals, *The American Messenger,* an illustrated religious

monthly; *The Amerikanischer Botschafter,* a German paper for the home; *Apples of Gold,* an illustrated weekly for the Sunday school, and *Manzanas de Oro,* an illustrated Spanish weekly for the Spanish-speaking Sunday schools.

AMERICAN UNIVERSITY, The. A post-graduate institution, located at Washington, D. C., incorporated under the government of the District of Columbia in 1891, and later with enlarged charter from Congress of the United States; founder and first chancellor, Bishop John Fletcher Hurst; opened in 1914 by President Woodrow Wilson; campus of 93 acres at intersection of Massachusetts and Nebraska avenues. Total assets, $3,000,000. Library of 25,000 volumes. Awarded its first fellowship in 1915 and conferred its first degrees in 1916. Conducts courses leading to the master's and doctor's degrees, gives fellowships for research at other institutions and presents university extension lectures to the public.

AMERICAN WAR COMMISSION TO RUSSIA. On 1 May 1917 it was announced that Elihu Root had been appointed head of the war commission from the United States to Russia; and a fortnight later the commission left Washington, carrying greetings to the new democratic government of Russia and authorized to pledge aid from the United States, not only in the prosecution of the war against the Central Powers, but also in the rehabilitation of Russia. With Mr. Root were: John R. Mott, S. Reading Bertron, Cyrus H. McCormick, James Duncan and Charles Edward Russell, envoys extraordinary; Maj.-Gen. Hugh L. Scott, chief of staff of the army, military representative of the President; Rear-Admiral James H. Glennon, naval representative of the President; Col. R. E. L. Michie, aide to the chief of staff; Col. William V. Judson, military attaché to the diplomatic mission; Lieut.-Col. T. Bently Mott, military aide to the ambassador extraordinary; Surgeon Holton C. Curl, United States Navy; Lieut. Alva D. Barnhard, United States Navy, aide to Admiral Glennon; James McKenna, disbursing officer of the mission, and a number of clerks, etc. The commissioners traveled overland to the Pacific coast, and there boarded a fast warship for the voyage. On 13 June the commission arrived in Petrograd, where it was greeted by a large delegation of Russians and Americans. The American ambassador, David R. Francis, issued a statement explaining the aims of the mission, which have been given above. On 15 June Mr. Root, addressing the Council of Ministers, expressed the desire of the people of the United States to defend and preserve democracy. M. Tereschtenko, Minister of Foreign Affairs, responding in behalf of the council, expressed the cordial attitude of the Russian government toward the United States, and said that the Russian people considered the war inevitable and would continue to do their part. On 23 June, in Moscow, Mr. Root addressed six important organizations; and in company with the Foreign Minister he subsequently visited staff headquarters at Mohilev, where he was welcomed by the commander-in-chief, General Brusiloff, Major-General Scott and aides, escorted by officers of the Russian staff, visited Kiev and the southwestern front. The members of the commission in general received favorable impressions of the new Russia; their elucidation of American purposes and their authoritative promises of co-operation proved to be of great service in nullifying the effects of German intrigue; and their diplomatic efforts received valuable support from the activities of the American Railroad Commission, which had arrived at Vladivostok about the beginning of June, to assure and to provide indispensable aid to Russia in the construction of railways and the supply of materials. Preparations to fulfil such engagements on a vast scale were already far advanced in the United States, when the commission made its report and its appeals for public approval of the new Russia at Washington and New York in August. The commission's leader then said: "We took to the Russians a message of faith and democracy. We return to repeat it."

AMERICAN WATER-COLOR SOCIETY. See WATER-COLOR SOCIETY, AMERICAN.

AMERICAN WHIGS. See WHIGS.

AMERICAN WOOD-PRESERVERS' ASSOCIATION. Organized at the World's Fair at Saint Louis in October 1904. Incorporated in Illinois on 7 March 1911, as the Wood-Preservers' Association. Title changed 6 March 1912 to the American Wood-Preservers' Association. The objects of the association are to promote the knowledge of the materials, methods and principles involved in the economic design, location, construction, maintenance and operation of wood-preserving works; the standardization of specifications for wood preservatives and for their introduction into the material to be preserved and the maintenance of high standards of business ethics in the wood-preserving industry. The association holds meetings annually for the presentation and discussion of reports of the experiences and investigations of its members and others, and publishes its 'Annual Proceedings' and a quarterly magazine, *Wood-Preserving.* The membership, numbering 287 on 1 June 1916, consists of corporate, associate, probate and honorary members. The revenue is obtained from the initiation fees and dues of members, and the management is in the hands of the executive committee, which comprises the president, two vice-presidents, secretary-treasurer and seven other members. On 1 Jan. 1916 there were 102 plants in this country preserving wood with creosote, zinc chloride and other chemicals for the purpose of protecting it against decay and thereby aiding in the conservation of our forest resources.

AMERICA'S CUP. See YACHTS AND YACHTING.

AMERICUS, Ga., town and county-seat of Sumner County, on the Georgia & A. and Central of Ga. railroads, about 75 miles southwest of Macon. It was settled in 1832, and is governed under a charter granted in 1889. There is a mayor and council of six. It is the business centre for a large cane and cotton region and has also several manufacturing industries. Pop. (1910) 8,063.

AMERIGHI, ä'mä-rē'gi Michelangelo. See CARAVAGGIO.

AMERIGO VESPUCCI, ä'mā-rē'gō vĕs-poot'chē. See VESPUCCI.

AMERIND, a word suggested by Maj. J. W. Powell to describe the American Indians as distinguished from other Indians.

AMERLING, ä'mer-lĭng, Friedrich, Austrian painter: b. Vienna 1803; d. there in 1887. He studied painting in Vienna, and also in London, Paris and Munich, and spent some years in Italy. Upon his return to Austria he was selected to paint a portrait of the Emperor Franz I, and from that time ranked as the most prominent portrait painter of that country. His portraits number about 1,000, and are distinguished by brilliant coloring, but sometimes fail of definiteness of characterization. Consult Bodenstein, 'Hundert Jahre Kunstgeschichte Wiens' (1888); and Frankl, 'Life' (1889).

AMERSFOORT, ä'mĕrz-fōrt, Holland, town in the province of Utrecht, and 12 miles northeast of the town of Utrecht. By the Eem, on which it stands, it has a navigable communication with the Zuyder Zee. It manufactures woolen goods, tobacco, glass and silk-yarn, and carries on an extensive trade in grain. The Roman Catholic church of Saint Mary, built in the 14th century, has a Gothic tower 308 feet high, considered to be one of the finest in Europe. There is a college of the Jansenists in the city, it being one of the chief centres of this sect, which does not now exist outside of Holland. The Grand Pensionary of Holland, Jan von Oldenbarneveldt, commonly called Barneveldt, was born here. Pop. 24,000.

AMERY, Leopold Charles Maurice Stennett, English journalist and politician: b. Gorakhpore, India, 22 Nov. 1873. Educated at Harrow and Balliol College, Oxford, he secured several «Firsts» and the Ousley scholarship in Turkish, as well as a fellowship for history at All Souls' College, Oxford. In 1896–97 he was private secretary to Mr. Leonard (now Lord) Courtney, and in the latter year set out on an extensive tour through southeastern Europe, contributing articles to English newspapers, which led to his joining the editorial staff of *The Times* in 1899. He was sent to south Africa shortly before the Boer war broke out, met President Kruger and the Boer leaders, and actually received permission from General Joubert to accompany the Boer army. Mr. Amery spent the first week of the war in the Boer camp at Sandspruit, when he was informed that his life was not safe. He proceeded to Cape Town and organized the staff of war correspondents of *The Times* — some 20 men attached to the various British columns. On his return he undertook the editorship of *The Times'* 'History of the War in South Africa' (7 vols., London 1900–09), meanwhile writing regularly on military, economic and imperial questions in the columns of that paper. His book, 'The Problem of the Army' (1903) was largely responsible for the subsequent reorganization of the War Office. He became a barrister in 1902, but never practised. In 1903 he followed Chamberlain in the great tariff reform struggle, in which he opposed Britain's Free Trade policy in the press and on the platform, his 'Fundamental Fallacies of Free Trade' (1906) being regarded as one of the best contributions to the controversy. After four unsuccessful attempts to enter Parliament — in 1906, 1908, January 1910 and December 1910 — he was returned unopposed for South Birmingham as a Unionist in 1911. Though short of stature and slim in build, he delights in neck-breaking adventures, having climbed in the Alps, the Balkans, the Rockies and the Drakensberg Mountains. He traversed the Fraser River for 300 miles in a boat (1909) and in 1910 accompanied the late Lord Grey, then governor-general of Canada, on a 400 miles' canoe expedition. Shortly after the outbreak of the European War Amery received a commission with the rank of captain and attached to the staff in France as interpreter. In 1915 he was sent on a special mission to the Balkans, appointed general-staff officer in 1916, and assistant secretary to the War Cabinet in 1917. Mrs. Amery is a Canadian lady, sister of Lieut.-Col. Sir Hamar Greenwood, Member of Parliament.

AMES, Adelbert, American soldier: b. Rockland, Me., 31 Oct. 1835. Graduating at West Point in 1861 he was assigned to the artillery and served through the Civil War with distinction; was wounded at Bull Run and brevetted for gallantry there; took part in nearly all the battles of the Peninsular campaign, in Fredericksburg, Chancellorsville, Antietam, Gettysburg and before Petersburg; was brevetted colonel, was brevetted major-general of volunteers for conduct at the capture of Fort Fisher and major-general in the regular army for general conduct in the war. From 1868 to 1876 he was in the thick of the «carpet-bag» troubles; upheld by United States troops, the negro vote and recent immigrants, and bitterly fought by the mass of the white inhabitants. Mississippi was among the last of the revolted States to accept Reconstruction or the War Amendments as fixed facts and the preponderant negro population made the race problem more acute there than anywhere else in the South. The elements at Ames' disposal were unfit to base even a decent civilized structure upon, and the State soon went into anarchy tempered by local vigilance committees. In 1873 he was elected governor of Mississippi. His governorship was charged with sacrificing the civilized interests of the State to the blacks, and on 7 December there was a sanguinary race riot at Vicksburg, followed by others throughout the State. Ames sent to Washington for more troops to maintain order, the white party countered with fresh charges, a congressional investigating committee was appointed, and for two years the State had — like several Southern States through this period — a formal government perfectly powerless, and a real government consisting of the rough consensus of interest among the larger white landowners. The legislature which met in January 1874 impeached Ames and all his executive officers; the State administration was paralyzed; the national administration tired of upholding impossible local governments; and Ames finally agreed to resign if the impeachment were withdrawn. He at once removed to New York; later to Lowell, Mass. In the Spanish-American War he was a brigadier-general of volunteers.

AMES, Charles Gordon, American Unitarian clergyman, editor and lecturer: b. Dorchester, Mass., 3 Oct. 1828; d. 15 April 1912. He was graduated at the Geauga Seminary, Ohio, and ordained in 1849 as a Free Baptist, but later became a Unitarian and succeeded James Freeman Clarke as pastor of the Church of the Disciples, Boston. He was editor of the Minnesota *Republican,* the first Republican paper in the Northwest, in 1854, and the *Christian Register* of Boston, 1877–80. He wrote 'George Eliot's Two Marriages' (1886); 'As Natural as Life' (1894); 'Poems' (1898); 'Sermons of Sunrise' (1901); 'Five Points of Faith' (1903); etc. He was always deeply interested in social and philanthropic questions.

AMES, Edward Raymond, American clergyman: b. near Amesville, Adams county, Ohio, 20 May 1806; d. Baltimore, Md., 25 April 1879. He was educated at Ohio University, Athens, Ohio, but left at the end of his junior year and became the first principal of Lebanon Seminary, afterward McKendree College. In 1830 he joined the Illinois Conference of the Methodist Episcopal Church; 1840–44 he was one of the three corresponding secretaries of the Missionary Society. In 1852 he was elected bishop. During the Civil War he, with Bishop Simpson, often aided President Lincoln by their counsel. The War Department gave into his care many unoccupied churches of the M. E. Church South. This was done as a war measure.

AMES, Fisher, American orator and statesman: b. Dedham, Mass., 9 April 1758; d. there, 4 July 1808. His father died when he was six. A precocious scholar, he was graduated from Harvard at 16; taught school some years to support his impoverished family, cultivating himself by wide reading and profound study of the classics and the Scriptures; studied law, and began practice in Dedham in 1781. He made a reputation as "Brutus" and "Camillus" in the Boston papers, was sent to the legislature in 1788, won laurels, and was elected to the convention to ratify the Federal Constitution. His speech there on biennial elections gave him fresh repute as one of our foremost orators. In December he was elected (Federalist) Representative to Congress, and re-elected through Washington's administration to 1797; he was chosen to pronounce the congressional address to Washington on his retirement; and on 28 April 1796 delivered his masterpiece of eloquence and effectiveness, on the appropriation to carry Jay's treaty of 1794 into effect — so impressive that the other party protested against taking a vote until after an adjournment, because the House was too excited to decide rationally. Retiring from public life on account of feeble health, he spent his later years mainly on his Dedham farm, though writing papers in 1798 to urge the Federalists to resist French aggressions, which was pouring oil on a conflagration (see ADAMS, JOHN; ALIEN AND SEDITION LAWS, and the names of the various political parties of the time), serving for a time on the State council, and delivering a eulogy on Washington before the legislature. He declined the presidency of Harvard in 1804. He was an orator by inspiration, studying his subject and taking notes to expand on the moment, and full of flashing epigrams and pregnant laconics. A large public school in Dedham Centre commemorates his name. Consult 'Works and Life' (1 vol., 1809; 2 vols., 1854, by his son Seth); selected speeches, 1 vol., 1871, by his grandson.

AMES, Sir Herbert Brown, Canadian legislator: b. Montreal, 23 June 1863, of American parents. He was graduated B.A. at Amherst College, Massachusetts, in 1885. An alderman of Montreal 1898–1906, and chairman of the municipal board of health 1900–04, he has represented the Saint Antoine division of Montreal in the House of Commons in the Conservative interest since 1904, and since 1911 has been chairman of the House's standing committee on banking and commerce. He is honorary secretary of the Canadian Patriotic Fund and was knighted in 1915. He is a close student of economic and social conditions, and is the author of 'The Machine in Honest Hands' (1894); 'The City Below the Hill' (1897); 'The City Problem' (1901), etc.

AMES, Joseph, painter: b. Roxbury, N. H., 1816; d. New York, 30 Oct. 1872. Though wholly self-taught he early began portrait-painting, opened a studio in Boston, and had success enough to obtain means to go to Rome and study. While there he painted a fine portrait of Pius IX. He was elected member of the National Academy of Design, 1870, and soon had more orders than he could fill. Some of his best known portraits are those of Ristori, Prescott, Emerson, Rachel and President Felton of Harvard. 'Maud Muller' and 'The Death of Webster' are his best known ideal paintings.

AMES, Joseph Sweetman, American physicist: b. Manchester, Vt., 3 July 1864. He was graduated at Johns Hopkins University in 1886 and is professor of physics there. He is author of 'Theory of Physics' (1897); 'Manual of Experiments in Physics' (1898); 'Free Expansion of Gases' (1898); 'Induction of Electric Currents' (2 vols., 1900); editor 'Scientific Memoir Series,' 'Fraunhofer's Papers'; assistant editor *Astro-Physical Journal; American Journal of Science.*

AMES, Nathan P., American manufacturer: b. 1803; d. 23 April 1847. In 1829 he established cutlery works at Chicopee Falls, Mass., which attained a national reputation, their swords especially being largely bought by the United States. In 1834 he removed the works to Cabotville (Chicopee), where he lived and died; and incorporated with others the Ames Manufacturing Company, which in 1836 added a bell and bronze cannon foundry that had equal fame and furnished the larger part of the government's brass cannon in the Civil War, as well as the bronze statues of De Witt Clinton in Greenwood Cemetery, Brooklyn, N. Y., of George Washington in Union Square, New York, and of Benjamin Franklin in School Street, Boston. The works supplied the British government just before the Crimean War with machines for making muskets.

AMES, Oakes, American manufacturer and promoter: b. Easton, Mass., 10 Jan. 1804; d. 8 May 1873. The son of a blacksmith who had become a manufacturer of highly reputed picks and shovels, he trained himself in his father's

works, and with his brother joined the firm as Oliver Ames & Sons. The opening up of California in 1848 and Australia in 1851 by the gold discoveries created an immense demand for their goods in mining, settlement and railroad building, which raised the firm to the front rank in business and wealth; and in the Civil War they had great contracts for shovels, swords, etc. Mr. Ames was in the Massachusetts executive council 1861, and Congressman 1862 till death. In 1864 the failure of attempts to carry through the nationally exigent Pacific Railroad led President Lincoln's government to call on Mr. Ames to undertake it. He risked financial ruin if it failed, investing $1,000,000 and making his whole fortune responsible for the rest; it could not be expected that he should forego a corresponding profit if it succeeded. The work was finally accomplished by organizing a construction company (see CREDIT MOBILIER OF AMERICA), which paid itself largely in stock and bonds of the Union Pacific, practically making the two companies one, and enabling the former to charge the latter its own prices for work and supplies, the government paying the bills. Credit Mobilier stock became enormously valuable, and the directors were charged with cheating the government and using the stock to buy congressional support for the fraud. Mr. Ames' anomalous position as Congressman, director in both companies, contractor for immense supplies to the railroad, and the ablest manager of the whole enterprise, caused the chief fury of the assault to fall on him; and in the tremendous public scandal and investigation which followed he was censured by the 42d Congress and died shortly after. His son Oliver (q.v.), however, induced the Massachusetts legislature to re-examine the case, and on 10 May 1883 (the 14th anniversary of the completion of the railroad) it passed a resolution exonerating Mr. Ames. The Union Pacific Railroad erected a monument to his memory at Sherman, Wyo., the crest of the road, 8,550 feet above the sea.

AMES, Oliver, American manufacturer, brother of Oakes above: b. Plymouth, Mass., 5 Nov. 1807; d. 9 March 1877. His brother's partner, he was a sharer in all his business enterprises; president pro tempore of the Union Pacific Railroad 1866–68, formal president 1868–71; a director in the Credit Mobilier. After his brother's death he became head of the manufacturing firm. He was a member of the State senate, 1852 and 1857.

AMES, Oliver, American manufacturer, son of Oakes above: b. North Easton, Mass., 1831; d. 1895. He was trained in his father's works, and as his heir spent several years in paying off the obligations of millions of dollars incurred by the Union Pacific Railroad and other undertakings. Entering public life avowedly to vindicate his father's memory, he was lieutenant-governor of Massachusetts 1882–86; in 1883 obtained the vindicatory resolution he sought; and 1886–88 was governor.

AMES, Samuel, American jurist: b. Providence, R. I., 6 Sept. 1806; d. there, 20 Dec. 1865. Was graduated at Brown, 1823; studied law with Judge Gould at Litchfield, Conn. He served for many years in the Rhode Island State assembly, being speaker 1844–45. He was elected chief justice of the State Supreme Court 1856, but resigned in 1865 on account of ill-health. In 1839 he married Mary Throop Dorr, daughter of Thomas W. Dorr, leader of the rebellion in 1842. Author and editor of 'Angell and Ames on Corporations,' and Vols. IV–VII of the 'Rhode Island Reports.'

AMES, Iowa, city of Story County, on the Chicago & N. W. Railway, and on the Lincoln Highway, 38 miles north of Des Moines. Settled in 1864 and named after Oakes Ames, one of the railway pioneers of the region, it was incorporated in 1869. The city maintains electric lighting plant and water works, a Carnegie library, and has manufactures of pennants and banners. Its chief claim to distinction is the munificently equipped Iowa State College of Agriculture and Mechanic Arts. Pop. 5,500.

AMESBURY, Mass., town in Essex County, situated on the Merrimac River and on the Boston & Maine Railroad, 27 miles north of Salem. It has manufactories of automobiles and automobile fittings, carriages, motor boats, boots and shoes, hardware, etc. The United States census of 1914 showed 59 establishments of factory grade, employing 1,628 persons, of whom 1,451 were wage earners receiving annually $1,009,000 in wages. The capital employed totalled $2,604,000, and the value of the output was $3,554,000; of this, $1,746,000 was added by manufacture. The town was originally a part of Salisbury, but was set off in 1654 as New Salisbury. It was incorporated in 1666, and a year later received its present name. Amesbury was long the home of the poet Whittier, who died here in 1892. Pop. 9,894.

AMETABOLA, those insects in which development is direct, there being no metamorphosis.

AMETHYST (from the Greek *amethystos,* "not intoxicated"). In mineralogy (1) a violet or purple variety of crystallized quartz, the color being probably due to traces of manganese or iron. It is esteemed as a gem, and was worn by the Greeks in the belief that it lessened the intoxicating effects of alcoholic drinks upon its possessor. It is widely distributed, but specimens pure enough in color to be used as gems are not common. The finest amethysts come from Brazil, India, Siberia, Pennsylvania and North Carolina. (2) The precious (or Oriental) amethyst is a crystalline oxide of aluminum, violet in color from the presence of traces of some other metallic oxide, and very brilliant and beautiful. Mineralogically the Oriental amethyst is a variety of corundum (q.v.).

AMHARA, ȧm-hā'rȧ, a district of Abyssinia, lying between the Tacazzé and the Blue Nile, but of which the limits are not well defined. The Amharic language, next to the Arabic the most widely used of all the Semitic languages, has gradually gained ground in southern and central Abyssinia, and has become the court language. It has a literature of its own, including a version of the Scriptures.

AMHERST, Jeffery, BARON, British soldier remembered for his American services: b. Kent, England, 29 Jan. 1717; d. 3 Aug. 1797. He was a duke's page, by his favor entering the army as ensign at 14, and became General Lord Ligonier's aide; served through the war of the Aus-

trian Succession, 1741–48, and was at Dettingen (1743), Fontenoy (1745) and Roncoux (1746); in the Seven Years' War beginning 1756 he was at the French victory of Hastenbeck, 1757. He had become noted as a brilliant soldier and ranked as lieutenant-colonel; in 1758 Pitt selected him to co-operate with Prideaux in conquering Canada from the French, made him major-general, and gave him command of the expedition against Louisburg, which he speedily reduced, 27 July. In the following September he superseded Abercromby as commander-in-chief of the English forces in America and captured Crown Point and Ticonderoga the following year. On 8 Sept. 1760 he captured Montreal and ended the French dominion in Canada. For this he was made governor-general of the British possessions in America, thanked by Parliament, and made a Knight of the Bath. But in face of Pontiac's conspiracy (1762) he failed, as other English commanders had so often before, from insisting on conducting Indian like European warfare, and despising the American militia and American experience. But as American trivialities like Pontiac's war were unknown or unregarded in England, Amherst on his return in 1763 was received with immense enthusiasm as the conqueror of Canada; and as he was also a favorite of George III, and actively supported the policy of coercing the colonies through the years before the Revolution, his honors did not cease. He was titular governor of Virginia 1763–68, without going there, governor of Guernsey from 1770 on, privy councilor, 1772 on, 1772–82 and 1783–93 commander-in-chief of the British army, and was made a field marshal on resigning his command. In 1776 he was raised to the peerage. In 1780 he took an active and most humane part in suppressing the London «no popery» riots.

AMHERST, Burma, a town and district in the Tenasserim division, about 30 miles south of Moulmein. It was founded by the British in 1826, and named after the governor-general of India of that day; but in 1827 the headquarters were transferred to Moulmein. Amherst has been eclipsed by the latter city, and is now merely a bathing-place for Moulmein. The district forms a narrow strip of land between the Indian Ocean and the mountains which separate it from the independent kingdom of Siam. It has an area of 7,062 square miles and a population of about 300,000; it consists partly of fertile valleys and partly of a rich alluvial tract. The highways of the Salween and the Gyaing rivers bring down inexhaustible supplies of rice to Moulmein, the chief town of the district. There is a very heavy rainfall approaching 150 inches in the year, but the temperature is uniform (at about 80° F.) throughout the year.

AMHERST, Canada, port of entry and capital of Cumberland County, Nova Scotia, situated on an arm of Cumberland Bay, an extension of Chignecto Bay, the extreme northeastern arm of the Bay of Fundy; on the Intercolonial Railway, 138 miles north by west of Halifax, Nova Scotia, and about midway between that city and Saint John, New Brunswick. It was formerly called Fort Lawrence. Amherst is the centre of a rich agricultural and lumbering district; has factories, iron-foundries, tanneries and ship-building establishments; and has an especially large trade in lumber and ship-building. Some of the richest coal mines in the province are near here, and grindstones and gypsum are quarried in the vicinity. Pop. (1911), 8,973.

AMHERST, Mass., a town in Hampshire County, on the Boston & Maine and the Central Vermont railroads, 23 miles northeast of Springfield. It has manufactories of paper, straw and palm-leaf hats and leather, and is best known as the seat of Amherst College (q.v.), the State Agricultural College and the State Experiment Station. Pop. (1916), 5,300.

AMHERST COLLEGE, one of the best known institutions of learning in the United States, is situated in Amherst, Hampshire County, Mass. The cornerstone of the present South College, the first of the college buildings, was laid on 9 Aug. 1820, and upon this occasion an address was delivered by Noah Webster. Exercises of dedication and inauguration were held on 18 Sept. 1821, and on the following day, with a president, two professors and 47 students, the work of the college was begun. The first president was the Rev. Zephaniah Swift Moore, D.D., who had resigned the presidency of Williams College in order to come to Amherst, and who brought with him 15 students from Williamstown. After two adverse votes in the legislature the college finally secured a charter from the commonwealth, the date of its approval being 21 Feb. 1825. A number of students in the intervening classes, being compelled to graduate without a degree, received their degrees from Union College, on suitable certificates from Amherst. Of the charter just mentioned a few words are all that the present sketch permits, or that are pertinent to present conditions. As to the board of trustees, it «provided, . . . that the number of members (including the president of said college for the time being, who shall *ex officio* be one of said corporation) shall never be greater than seventeen»; and as to keeping that number good, it was in the same section «provided, further, that as vacancies shall occur in said board, they shall be so filled that the said board shall as soon as may be, and forever after, consist of seven clergymen and ten laymen.» The first five vacancies that occurred in the board were filled by vote of the legislature; but when, 50 years after the founding of the college, the number of alumni had become sufficient to warrant it, the alumni were empowered to choose five members of the board, electing one each year as their terms of service expired. Regarding instructors and students, it was enacted, «That no instructor in said college shall ever be required by the trustees to profess any particular religious opinions as a test of office; and no student shall be refused admission to or denied any of the privileges, honors or degrees of said college on account of the religious opinions he may entertain.» By an act approved 4 Feb. 1916, that part of the act of 1825 which required that the board of trustees should consist of seven clergymen and ten laymen was repealed. Amherst College is a college of liberal arts and sciences and does not undertake to provide a technical training. The course of study, normally requiring four years, and leading to the degree of bachelor of arts, is

partly prescribed and partly elective. The requirements for admission are based upon the subjects usually studied during a four years' course in the best high schools. In order to secure a degree a student must complete 40 semester courses which shall include one year of English, one year of mathematics, one year of history or philosophy, two years of Greek or two years of Latin, two years of science in the group, biology, chemistry, physics, and he must have a reading knowledge of either German or a Romance language (French, Italian or Spanish). In addition to the 40 courses, work is required in public speaking and in physical education. On the other hand, the fact that many courses are elective allows a student to follow to some extent his own inclinations; in fact it is possible for a student to so shape his college course that after graduation he may secure an engineering degree from a technical school by two years of additional study. The college also offers to holders of the bachelor's degree a year's course of study leading to the degree of master of arts. For many years the college offered a course leading to the degree of bachelor of science. The requirements for this degree placed less emphasis upon the classical languages and more upon the sciences than do those of the course leading to the degree of bachelor of arts. No candidates have been accepted in this course, however, since those who entered college in 1913. The catalogue for the academic year 1915–16 shows a student enrolment of 429, and a faculty of 48 actively engaged in teaching. Since the college was founded about 9,000 students have been enrolled, and of this number about 5,000 are living. The buildings and equipment are valued at approximately $1,200,000 and include, besides recitation halls, laboratories, dormitories, etc., an infirmary, a gymnasium, two large athletic fields and a skating rink. The college has also many valuable collections. Among these are the Adams collection of shells, a part of Audubon's celebrated collection of birds, the Woods collection of minerals, the Shepard collection of meteorites, the famous Hitchcock ichnological collection, an anthropological collection and an unusually complete and interesting collection of Indian relics. The total funds of the college amount to over $2,800,000, of which the income of more than $420,000 is available annually for fellowships, scholarships and prizes. The corporate name of the institution is "The Trustees of Amherst College."

AMHERSTBURG, Canada, a town in Essex County, Ontario, on the Michigan Central Railway, 16 miles from Sandwich. It is situated on the Detroit River, and among its industries are an automobile factory and a knitting factory. Valuable limestone quarries and a soda ash plant are in the neighborhood. Pop. (1911), 2,560.

AMIANTHUS, ă-mē-anth'uz ("undefiled"), a name applied to the finer kinds of asbestos in consequence, it is said, of the mineral being unaffected by fire. Some of the finest amianthus, with long, silky, flexible fibres, occurs in the district of the Tarentaise in Savoy.

AMICE, ăm'is, or **AMICT** (Lat. *amictus*, girt around), a vestment worn by priests in the Roman Catholic Church during the celebration of mass. After the general adoption of the cravat had rendered the amice unnecessary as a neckcloth, it was retained for the significance which it had acquired as an emblem of the cloth wherewith the Saviour was blindfolded by the Jews the night before his crucifixion.

AMICI, ą-mē'chē, **Giovanni Batista,** an Italian savant: b. in Modena 1786; d. 1864. He studied natural history at Bologna, and mathematics at Modena. He became professor of mathematics at the College of Panaro, and for some time general inspector of education in Modena, where in 1831 the Grand Duke of Tuscany appointed him director of the Florence observatory, as successor of the celebrated comet-discoverer, Luigi Pons. This office he held until his death, publishing every year the result of his astronomical observations, at the same time contributing important papers on natural history to the *Memorie della Società Italiana.* Science is especially indebted to him for his improvement of the telescope, of several microscopes, and of the camera lucida, invented by Hooke and Wollaston. He seems to have from his earliest life devoted much attention to optical instruments, and before he was 20 he made a telescope of a mixture composed by himself. In 1827 he made dioptric microscopes, which are sold with his name attached, and, notwithstanding the improved microscopes of Oberhäuser, are still in great favor. He was assisted in his labors by his son, Vincenzo Amici, who was professor of mathematics at the University of Pisa.

AMICIS, ą-mē'chēs, **Edmondo de,** Italy's foremost descriptive writer: b. Oneglia, of Genoese parentage, 21 Oct. 1846; d. Bordighera, 11 March 1908. Educated at Coni and Turin, he attended the Modena military school; entered service 1863 as sub-lieutenant, acted against the Sicilian brigands and served through the Austro–Prussian War of 1866. He remained in the army till the occupation of Rome in 1870; but his literary vocation was plain. In 1867 he took charge of a Florentine paper, *L'Italia Militare.* In 1868 his first volume, 'Military Sketches,' short stories of the phases of a soldier's life, had sweeping success and marked him as the coming Italian litterateur; and in 1871 he settled at Turin and devoted himself to authorship. His next work was 'Recollections' (of 1870–71), dedicated to the youth of Italy; a fresh collection of stories followed. But a craving for travel turned him into the path which has given him his greatest fame: the foreign world at least knows him mainly by the brilliant, glowing volumes describing the countries of Europe and other continents he visited, their national characteristics and habits, and, most of all, the springs of their life and thought. They are enthusiastic, sympathetic, optimistic, full of sensuous delight in beauty, rich in color and vivid in clearness of portrayal; but they exhibit too a marvelously keen analytic power as well as acute photographic sensitiveness to impressions and marvelous literary skill in translating them into language. The greatest of these perhaps is 'Holland' (1874), a singularly fine analysis of the essence of Dutch life and the sources of Dutch art in that life; others are 'Spain' (1873), 'Recollections of London' (1874), 'Morocco' (1876), 'Recollections of

Paris' (1878), 'Constantinople' (1878). He published also in these times 'Literary Portraits' (1881), sympathetic studies of Daudet, Zola, Dumas, Jr., Augier, Coquelin and Déroulède; 'The Friends,' on friendship in general (1882); historical novelettes, a collection in part old, entitled 'The Gate of Italy' (1884); 'On the Ocean' (1889). Later, educational and social problems deeply occupied his mind: his 'Cuore' (Hearts; Englished as 'The Heart of a Schoolboy'), a juvenile in which a pupil tells the events of a school year day by day, has sold nearly 200,000 copies in Italy; a novel for adults on similar lines is 'The Workmen's Mistress' (1895); followed the same year by 'The Romance of a Master' (1895), which has a strong socialistic bent. He avows himself that he thinks Socialism the only available spring of a vital Italian literature now. His latest works are: 'Everybody's Wagon' (1899), 'Memories' (1899), 'Hope and Glory' (1900), and 'Records of Infancy and School' (1901). See CUORE.

AMICUS CU'RIÆ, in law, a person who acts in a suit to instruct the court as to facts or as to law. Usually a person so acting is an attorney-at-law, and he may inform the court either on matters of fact or on points of law of which the court is doubtful. He has much less control over an action than an attorney of record, but in some jurisdictions he may move to quash an indictment or set a proceeding aside.

AMIDE (am'id; from *ammonia,* + *ide*), in chemistry, a general name for a class of bodies which may be regarded as derived from ammonia, NH_3, by replacing one or more of the hydrogen atoms in that substance by an equal number of monovalent acid radicals. Thus formic acid, H.CO.OH, may be regarded as a hydrate of the acid radical HCO; and the compound $HCO.NH_2$, which is known as "formamide," and is obtained by the action of ethyl formate upon ammonia, may be regarded as derived from ammonia by the substitution of the radical HCO for one of the hydrogen atoms in NH_3. Similarly, acetic acid, $CH_3.CO.OH$, may be regarded as a hydrate of the radical "acetyl" (C_2H_3O); and acetamide, which has the formula $C_2H_3O.NH_2$, and is produced by the action of ethyl acetate upon ammonia, may be regarded as derived from ammonia by the substitution of the radical "acetyl" for one of the hydrogen atoms in the ammonia.

Taking the general formula of a normal fatty acid as X.CO.OH, where X represents an alcohol radical (see ALCOHOL), an amide may be formed by substituting the monovalent acid radical, XCO, for one of the hydrogen atoms in NH_3. The resulting substance, $XCO.NH_2$, is called the "primary amide" of the acid radical XCO. By the further substitution of XCO for one of the atoms of hydrogen remaining in the primary amide, a "secondary amide" of the same acid radical is obtained, having the formula $(XCO)_2.NH$. It is evident that a "tertiary amide," having the formula $(XCO)_3N$, is also possible.

For some purposes it is convenient to regard the primary amide, $XCO.NH_2$ of the monobasic acid X.CO.OH, from the opposite point of view; namely, as derived from the acid by the substitution of the radical NH_2 for the hydroxyl group OH. Obviously the result is the same in either case; but this latter view makes the deportment of dibasic acid radicals easier to describe. Thus in the dibasic acid Y $(CO.OH)_2$ (where Y is a divalent radical), the first result of the substitution of NH_2 for OH is the formation of the body $Y(CO.OH).(CO.NH_2)$, which is both an acid and an amide—an amide because it is obtained by the substitution of NH_2 for OH, and an acid because it still contains one molecule of hydrogen that is replaceable by a monovalent metal or radical (namely, the molecule of H in the OH). Bodies of this type are called "amic acids."

If the molecule of OH remaining in an amic acid is replaced by a further substitution of NH_2, the resulting substance, $Y(CO.NH_2)_2$, is called a "di-amide," and may be regarded as formed from two molecules of ammonia by the substitution of the divalent acid radical $Y(CO)_2$ for one-third of the total hydrogen present in those molecules.

The chemistry of the amides is very involved. They are mostly solid bodies, neutral to litmus, but capable of forming compounds with acids. The amides may be formed in several ways: (1) By the action of ammonia on ethers; (2) by the action of ammonia on acid chlorides; (3) by the dehydration of ammonium salts; (4) by the action of ammonia on anhydrides; (5) from nitriles and cold concentrated hydrochloric acid; (6) by heating acids with ammonium sulphocyanide for several days. The most familiar example of the class is the primary amide of acetyl or "acetamide." This substance, which is usually obtained by the dry distillation of acetate of ammonium at temperatures exceeding 375° F., has the formula $C_2H_3O.NH_2$, as noted above, and forms hexagonal crystals. It melts at about 180° F., boils at about 432°, and is quite soluble in water. Diacetamide, $(C_2H_3O)_2.NH$, and triacetamide, $(C_2H_3O)_3.N$, are also known. See AMINE; IMIDE; NITRILE.

AMIDO-ACIDS, substances derived from organic acids by the substitution of an NH_2 group for one or more of the hydrogen atoms in direct connection with a carbon atom. They often form intermediary products in the metabolism of proteids. In the process of digestion notably, the proteids (albumens) undergo a gradual series of transformations whereby the complex proteid molecule is broken down into simpler and simpler compounds, until at the end of the process carbonic anhydride, water, urea, uric acid, ammonia, etc., are the results. While these end products of metabolism are well known, the intermediary products are the object of much inquiry. In the intestinal canal, under the prolonged action of the pancreatic juice ferments, simpler nitrogenous principles are found, leucine, tyrosine, aspartic acids—these belong to the general group of the amido-acids. Schutzenberger has described amido-acids of the (1) leucine class, $C_nH_{2n+1}NO_2$—such as alanine, propalinine, butalanine; (2) of the acrylic series, $C_nH_{2n-1}N_2O$; (3) amido-acids of the glucoprotein class, sweet in taste, with the general formula $C_nH_{2n}N_2O_4$; (4) amido-acids such as tyrosine, tyroleucine and glutaminic acid. Con-

sult Shäfer, 'Text-book of Physiology' (Vol. I, p. 30).

AMIEL, ä'myĕl', **Henri Frédéric**, Swiss essayist, philosophical critic and poet: b. in Geneva, 27 Sept. 1821; d. there, 11 March 1881; was for five years a student in German universities, and on his return home became professor of philosophy in the Geneva Academy. He is author of several works on the history of literature, as 'The Literary Movement in Romanish Switzerland' (1849); 'Study on Mme. de Staël' (1878); and of several poems, among them 'Millet Grains' (1854). But his fame rests principally on the 'Journal,' which appeared after the author's death, and translated into English by Mrs. Humphrey Ward. This journal is a complete revelation of a cast of mind expressing great passion and full of original power and spiritual yearning. It is fascinating and subtle rather than stimulating or strong, and is esteemed more for its beauty of form then for any definite teaching it contains. Consult Arnold, Matthew, 'Essays in Criticism'; Bourget, 'Nouveaux essais de psychologie contemporaine' (Paris 1885); Vadier, 'Life of Amiel' (ib. 1885). See AMIEL'S JOURNAL.

AMIEL'S JOURNAL INTIME. Henri Frédéric Amiel, though for more than 30 years professor in the Academy of Geneva, is remembered almost solely for his 'Journal Intime,' to which he confided thoughts and impressions, chiefly psychological, that he could not find the will to publish during his life. He bequeathed it, a manuscript of 1,700 pages, to Genevese friends that they might publish from it whatever seemed "to possess interest as thought or value as experience." A first volume appeared in 1883 with a notable introduction by Edmond Scherer. A second and last followed in 1884. Both have been exceptionally well translated, with a thoughtful introduction, by Mrs. Humphrey Ward. The 'Journal' made an immediate and deep, though not wide, impression as being, in the words of Renan, "the perfect mirror of a modern mind of the best type, matured by the best modern culture, and also a striking picture of the sufferings which beset the sterility of genius." The morbid introspection that numbed action in Amiel, as in Shakespeare's 'Hamlet,' seems to have been intensified by the conditions attending the recognition of his talent that he gained on his return to his native Geneva after six years' philosophical study, chiefly in Germany. A democratic revolution had displaced in the city the old governing artistocracy in which was comprised nearly all its culture. To this new government he owed his professorship, an appointment which involved an almost complete social isolation of which the psychic effect is constantly reflected in the 'Journal.' Beauty of expression, psychological insight, untiring intellectual interest, and above all a power of revealing most poignantly an experience of spiritual uncertainty, in Scherer's words, "a will which wished to will but was powerless to furnish itself the motives for willing," which other over-refined and meditative minds feel to be akin to their own, assure the 'Journal' a high place in the literature of confession. There is a 'Life of Amiel' by B. Vadier. Consult Arnold, Matthew, 'Essays in Criticism,' and Bourget, 'Nouveaux essais de psychologie contemporaine.'

BENJAMIN W. WELLS,
Author 'Modern French Literature.'

AMIENS, ä'myăn', an old French city, once the capital of Picardy, and now of the department of Somme, on the many-channeled navigable Somme, 81 miles north of Paris by rail. Its fortifications have been turned into charming boulevards, but it still retains its old citadel. The Cathedral of Notre Dame is a masterpiece of Gothic architecture. Begun in 1220, it is 470 feet long, and has a spire (1529) 426 feet high; but its special feature is the loftiness of the nave, 141 feet. In his little work called 'The Bible of Amiens,' Ruskin says this church well deserves the name given it by Viollet-le-Duc, "the Parthenon of Gothic architecture," and affirms that its style is "Gothic, pure, authoritative, and unaccusable." Other noteworthy buildings are the Hôtel de Ville (1600–1760), in which the Peace of Amiens was signed; the large museum (1864), in Renaissance style; and the public library, founded in 1791. Amiens has considerable manufactures of velvet, silk, woolen and cotton goods, ribbons and carpets. Peter the Hermit and Ducange were natives, and there are statues to both of them. The "Mise of Amiens," was the award pronounced by Louis IX of France, in 1264, on the controversy between Henry III of England and his people as to the "Provisions of Oxford." The Peace of Amiens (27 March 1802) was a treaty intended to settle the disputed points between England, France, Spain and Holland. By it England retained possession of Ceylon and Trinidad and an open port at the Cape of Good Hope; the republic of the Ionian Islands was recognized; Malta was restored to the Knights of Saint John; Spain and Holland regained their colonies, with the exception of Trinidad and Ceylon; the French were to quit Rome and Naples; and Turkey was restored to its integrity. In the Franco-Prussian War, on 27 Nov. 1870, General Manteuffel inflicted, near Amiens, a signal defeat on a French army 30,000 strong, and three days later the citadel surrendered. During the European War, with its defenses strengthened, it was important as a garrison railway and supply depot for the allied armies. Pop. about 92,000.

AMINA, the sleep-walking heroine of Bellini's opera 'La Sonnambula.'

AMINE (am'in; from *ammonia* + *ine*), a general name for a compound derived from ammonia by substituting one or more of its hydrogen atoms with an equivalent number of metallic atoms or basic organic radicals (Compare AMIDE). The reactions of the amines depend upon the class to which the substituted alkyl belongs — whether (1) all aliphatic; (2) part aliphatic and part aromatic — with the nitrogen ring attached to the aliphatic residue (as benzylamine); (3) part aromatic and part aliphatic with the nitrogen attached to a carbon atom of the benzene ring (as methylaniline); and (4) pure aromatic amines (as aniline, diphenylamine, etc.). Group (1) is known as the aliphatic amines; (2) as the aromatic amines; (3) and (4) as the aromatic amino-compounds. As in the case of the amides,

a given monovalent radical can form three compounds of this sort according as it replaces one, two or three of the hydrogen atoms of the original ammonia. For example, the monovalent basic radical "ethyl," C_2H_5, forms primary ethyl amine (or "ethylamine") $C_2H_5.NH_2$, when it replaces one atom of H in NH_3; secondary ethyl amine (or "diethylamine"), $(C_2H_5)_2.NH$, when it replaces two atoms of H; and tertiary ethyl amine (or "triethylamine"), $(C_2H_5)_3.N$, when it replaces all three of the hydrogen atoms in the ammonia. The base by which the hydrogen in the ammonia is replaced need not be organic. Potassium, for example, may replace an atom of it, with the formation of potassium monamine (or "potassamine"), $K.NH_2$. A derivative of ammonia, in which one atom of the typical hydrogen is replaced by a monovalent acid radical, and another by a monovalent basic radical or by a monad metal, may be considered to be either an amine or an amide. Thus $CH_3.C_2H_3O.NH$, in which one atom of the hydrogen has been replaced by the basic radical "methyl" (CH_3), and another by the acid radical "acetyl" (C_2H_3O), may be described as a modified methylamine, or as a modified acetamide. The amines are found in nature chiefly in the vegetable alkaloids. They occur also in the blood of some animals and generally among the decomposition products of both animal and vegetable organisms and also in decomposed minerals which have their origin in organic matter.

There are several methods by which amines may be prepared: (1) By the action of ammonia or its alkyl derivatives on substitution products of the hydrocarbons; (2) by the reduction of nitrogen-containing substances; (3) by the action of bromine and potash on the amides; (4) by the action of alkalies on alkyl isocyanates; (5) by hydrolysis of the alkyl esters of thiocarbamines and isocyanides with concentrated acids; (6) from compounds which certain substances form with alkyl halides; (7) by distillation of amino-acids with baryta. In addition, aliphatic primary and secondary amines may be obtained by the action of potash on the *p-nitroso* derivatives of secondary and tertiary aromatic amino-compounds, and tertiary amines may be secured by heating primary and secondary bases with an excess of potassium alkyl sulphate. Secondary and tertiary aromatic amino-compounds (dimethylaniline, etc.) are prepared on a large scale by heating the primary amines under pressure with alcohol and hydrochloric or sulphuric acid, at a temperature of from 360° to 400° F.

When ammonia is added to a cold solution of a salt of an amine, the amine is expelled from its combination and precipitated.

The amines of the aliphatic series are generally inflammable gases, or volatile liquids with a low boiling point and a density about 75 per cent that of water. They have a fishy odor, are decidedly alkaline, and are freely soluble in water. Some of the highest members of this class are odorless solids, becoming carbonates upon exposure to moist air. The aromatic amines (benzylamine, etc.) are comparatively few; they resemble generally the aliphatic amines, but are not so strongly basic.

The most important amines, in the arts, are methylamine, and aniline (q.v.).

AMINTA. The uncontested pre-eminence of the 'Aminta' of Tasso in the field of pastoral drama is due to the unusual manner in which the technical problems of the genre are solved. The stock objection to the pastoral as a whole is its artificiality, its failure to correspond to life — its violation, in a word, of the Aristotelian canon of "probability." Interpreting the 'Aminta' in the light of Tasso's 'Dialogues on Poetry,' it is apparent that he intended to evade this criticism in the typically pedantic fashion of the Renaissance: Aminta is of divine descent, and Silvia, his lover and future bride, is a nymph of Diana. In a world of divinities even the æsthetic shepherds of the pastoral are "probable" as well as possible. If we hold that this evasion is as futile as the objection itself, it is nevertheless clear that Tasso's poetic instinct served him better than his logic. The reality that fails to return through the divinity of his characters does arise from the atmosphere of humorous fancy into which the whole invention is thrown. A playfully mechanical plot — with two resurrections and a bloodless combat — continued in its lighter effects by character drawings humanly conventional (the philosophical spinster and the vanquished Diana), compensates by its gentle mirth for the absurdities inherent in the nature of the Arcadian world. It is only in the realm of fancy that the impossible becomes probable and necessary. And when this has been conceded, Tasso is free with all sincerity to yield his spirit to the voluptuous melancholy, the suppressed joys, the mellow anguish of sensuous passions experienced in an imagination aspiring to the ideal. This idealized sensuousness of the 'Aminta,' sustained by imagery free from crudeness but brilliantly visualized, enriched by suggestions of sadness and unsatisfied yearnings, pricking the intellect with paradox and metaphor and the memory with a wealth of erudite allusion, gave new direction to Italian Petrarchism generally and to the moods of pastoral poetry in particular. In the 'Aminta,' as well as in the 'Jerusalem Delivered,' the Marinists of the 17th century found the principal authority for their "lasciviousness." It was the delight of the *précieux* salons of Paris under Louis XIII and Louis XIV. Twenty-eight French translations have been made of this work. Of a dozen English renderings the first, by Abraham Faunce, appeared in 1591, and the best, by Leigh Hunt, in 1820. The 'Aminta' was composed as an entertainment for Giambattista Pigna, Prime Minister of Duke Alfonso of Ferrara, and produced for the first time at Belvedere-on-the-Po, Pigna's country estate, 31 July 1571.

ARTHUR LIVINGSTON,
Western University.

AMIOT, ą'myō', **Jean Joseph Marie**, French missionary: b. Toulon, February 1718; d. Peking, 9 Oct. 1793. He entered the Society of Jesus in 1737 and was sent in 1750 as a missionary to China. He soon won the confidence of the Emperor Kien-lung and spent the remainder of his life at Pekin. Amiot was eminently fitted to make good use of the advantages which his situation afforded, and his works did more than had ever been done before to make known to the Western World the thought and life of the Far East. His 'Dictionaire tatare-manchou-

français' (1789) was a work of great value, the language having been previously quite unknown in Europe. His other writings are to be found chiefly in the 'Mémoires concernant l'histoire, les sciences et les arts des Chinois' (15 vols., 1776–91); the 'Vie de Confucius,' the 12th volume of that collection, is complete and accurate.

AMIRANTE, am'i-rănt, **ISLANDS,** a group of small islands in the Indian Ocean, lying southwest of the Seychelles. They were taken possession of by Great Britain in 1814 and form a dependency of Mauritius. They produce cocoanuts, and turtle and fish are abundant. About six are inhabited.

AMIS ET AMILES, a'me' za a'mel', a chanson of the Middle Ages, dating from about the beginning of the 13th century. The work consists of 3,500 lines, in which are narrated the adventures of two friends.

AMISTAD, ä'mĕ'städ', **CASE,** in United States history, one of the landmarks of the slavery question. The Spanish government, by decree of December 1817, forbade the importation of slaves from Africa into its dominions after 30 Dec. 1820, on penalty of confiscation of the slave-ship and immediate freeing of the negroes. The trade nevertheless went on under transparent disguises. In the spring of 1839 the slave-hunters in Africa made a large capture of Sierra Leone natives, including their chief, Cinque, and sent them to Havana; where two months afterward two Cuban planters, Pedro Ruiz and José Montez, bought 38 youths and men, three girls and a boy, and shipped them on 27 June for Guanaja, Puerto Principe, on the schooner L'Amistad, under passport from the governor of Cuba obtained by falsely alleging that they were domestic slaves. Cinque organized a plan for revolt, and when four days out they rose, killed the captain and one of the crew, wounded two others in the contest, and forced the remaining whites to surrender; but they did them no violence, and set all on shore except the two planters, whom they managed to make understand that they must steer for Africa. These gradually changed course in the nights and fogs, and brought the vessel north off Culloden Point (near Montauk), at the east end of Long Island, where on 26 August she was noted as "suspicious" by Lieutenant Gedney of the coast survey, on the brig Washington. He sent a boat to her, and one of the planters declared himself the owner of the negroes and claimed United States protection. Some of them had gone on land in a boat; Gedney seized them as under New York State jurisdiction, and the vessel as a "prize rescued from pirates," and brought them to New London, Conn. The negroes were committed for murder on the high seas, to be tried at the Circuit Court of 17 September at Hartford, and meantime lodged in New Haven jail. The planters claimed them as slaves, appealed to the Spanish minister, Calderon, and he demanded their surrender of the United States district attorney for Connecticut. The latter wrote to the Secretary of State (Forsyth of Georgia) asking if the negroes under treaty with Spain might not be surrendered before the court sat; the Secretary transmitted the question to the President (Van Buren), but warned the district attorney to take care that no court whatever put the vessel, cargo or slaves beyond the control of the Federal executive. Meantime the anti-slavery interest had bestirred itself and secured funds, able counsel and an interpreter of African; and the Circuit Court (Judge Thompson) decided on the 23d that the killing of the captain of the L'Amistad, being an incident of the slave trade, was not a crime against the law of nations. The negroes were remanded to jail till the District Court in November should decide whether they were free or slave. The next day the United States Attorney-General, Felix Grundy of Tennessee, was ordered to prepare an official opinion on the Spanish minister's request and the claim of Gedney *et al.* for prize money. He replied in November that ship, cargo and negroes should be surrendered according to article 9 of the treaty of 27 Oct. 1795, as the United States under international law had no power to investigate the truth of facts stated in Spanish official papers,—in other words, whether the governor's passport was obtained by fraud, and the negroes were free according to the Spanish law already cited; though hardly one could speak a word of European and none much more, and the planters were obviously perjured in swearing ignorance of their being recently imported. But this article any way related only to vessels and goods rescued on the high seas from pirates; and under this interpretation the negroes were at once the pirates and the cargo, and had committed piracy in seizing themselves from their owners. The Spanish minister protested that no United States court had any jurisdiction. The administration, not daring to take the case out of its courts, went as far as it could by ordering the district attorney to act as legal adviser to the planters and file another indictment for them with new pleadings; sent a vessel to lie off New Haven in order to carry the negroes back to Cuba as soon as the District Court pronounced them slaves, as was taken for granted (this was the first trial for violating the slave-trade laws that had taken place except in slave States, where of course no convictions were ever found), and to do it instantly unless an appeal were interposed, which was "not to be taken for granted"; ordered that Gedney and his associate Meade accompany it to give evidence in court; and that these directions be kept secret. But the anti-slavery counsel had no difficulty in showing that kidnapping foreigners was not only not protected by United States or even Spanish law, but was directly contrary to both (the anti-slavery doctrine outside the courts was that the kidnapped had a natural right to kill their captors if they could, and a legal right to hold ship and cargo as prize in such case, and the United States had no right to interfere); and the court pronounced them free, and ordered them delivered to the United States executive to be sent back to Africa. The plaintiffs at once appealed to the Supreme Court, and the administration continued its partnership in a private suit. The case of the negroes was argued in February and March 1841 by John Quincy Adams, who had previously introduced resolutions into the House directing the President to report to Congress the authority by which Africans charged with no crime were held in custody; Roger Sherman

Baldwin, the district attorney, admitted in open court that they were newly from Africa when bought: and on 9 March the court (Taney, C. J.) pronounced them illegally held as slaves and liable to no punishment for their acts. The case roused the fiercest excitement in both the free and slave sections of the country. In 1844 the astounding bill was reported by the chairman of the House committee on foreign affairs to pay Ruiz and Montex $70,000 compensation; but it was laid on the table and never reappeared. This ends the "case," but a word may be added on the negroes. They were removed to Farmington, Conn., well cared for and instructed in the rudiments of education by a competent professor. Cinque kept them under stern discipline; they were excellently behaved and much liked; and some of them, being unusually quick of intelligence, were exhibited for proficiency in New England towns. About the end of November they were sent back to Africa with some missionaries, and a mission was afterward established in the district.

AMITE, La., town and parish-seat of Tangipahoa Parish, 65 miles northwest of New Orleans, on the Tangipahoa River and the Illinois Central Railroad. It is located in a thriving agricultural region and has a good trade in corn, cotton, fruit and vegetables. Irrigation is an important factor in crop raising. The town was destroyed by a cyclone in 1908, but was reconstructed within a few months. Pop. 2,200.

AMITOSIS. See MITOSIS.

AMITYVILLE, N. Y., village of Suffolk County, on the Long Island Railroad, 30 miles east of New York city. It contains a sanitarium, an infirmary, an academy, club houses and several churches. Located on Great South Bay it is a popular summer resort, with ample bathing, boating and fishing facilities. It is also a residential place for New York business men. Pop. 2,850.

AMLWCH, ăm'luk, a seaport town in north Wales, on the north coast of the island of Anglesey, and 14 miles northeast from Holyhead. The harbor is partly cut out of the solid rock. There are copper mines near the town, and mining is said to have been carried on here by the Romans. Pop. 5,000.

AMMAN, Jobst, ăm'măn, Swiss painter and engraver: b. Zürich 1539; d. Nürnberg 1591. Little of his personal history survives. It is supposed that before leaving Switzerland, he studied under some glass painter of that country, for stained glass is almost all that constitutes Amman's claim to be considered as a painter. His main work is in his engraving, which consists of no less than 540 pieces. It obtained for him a notable measure of success in Nürnberg, where he settled in 1560. He handled etching and wood-engraving with great skill, and has left a considerable body of work in his pen drawings. While not free from the mannerism that came in with his period, a sufficient measure of the excellence of his predecessors remains to make his work worthy of study. His aquarelles and wash drawings are also important. 'The Entrance of Emperor Maximilian II into Nürnberg' contains 450 figures. Of the greatest importance are his drawings for wood cuts, through which he exercised the widest influence of any artist of his time. He drew directly on the wood, and sometimes even cut the engravings himself. Among his etchings may be mentioned the portraits of Admiral de Coligny, of Martin Luther and of Hans Sachs, the 'Four Seasons,' 'The Twelve Months,' and religious works. The museum of Basel has the only well-authenticated painting by Amman, also a collection of designs for stained glasses executed in 1557. Consult Amman, 'Geschichte der Familie Amman von Zürich' (Zürich 1904) and Andresen, 'Der deutsche Peintre-Graveur' (Leipzig 1864–66).

AMMAN, Johann Conrad, Swiss physician: b. Schaffhausen 1669; d. Warmoud about 1730. After graduating at Basel in 1687 he began to practise at Amsterdam, where he gained a great reputation. He was one of the earliest writers on the instruction of the deaf and dumb, and first called attention to his method in his 'Surdus loquens' (1692). His process consisted principally in exciting the attention of his pupils to the motions of his lips and larynx while he spoke, and then inducing them to imitate these movements, till he brought them to repeat distinctly letters, syllables and words.

AMMANATI, ăm'mą-nä-'tē, **Bartolomeo,** Florentine architect and sculptor: b. Florence 1511; d. 1592. He studied under Bandinelli and Jacopo Sansovino, and closely imitated the style of Michelangelo. He was more distinguished in architecture than in sculpture. He designed many buildings in Rome, Lucca and Florence, an addition to the Pitti Palace in the last-named city being one of his most celebrated works. He was also employed in 1569 to build the beautiful bridge over the Arno, known as Ponte della Trinita — one of his celebrated works. The three arches are elliptic, and though very light and elegant have resisted the fury of the river, which has swept away several other bridges at different times. Another of his most important works was the fountain for the Piazza della Signoria.

AMMEN, Daniel, American naval officer: b. Brown County, Ohio, 15 May 1820; d. 11 July 1898. He entered the United States navy 7 July 1836 as midshipman. He was in the Wilkes exploring expedition 1838–42, in the East India squadron, and on the coast survey; on the expedition to the Paraguay River 1853–54. He commanded the Seneca at the capture of Port Royal, 7 Nov. 1861; promoted to commander 21 Feb. 1863; in charge of the Patapsco at the assault on Fort Macallister, 3 March 1863, and on Fort Sumter, 7 April; commanded the Mohican in the attacks on Fort Fisher, December 1864 and January 1865. He was commissioned captain 1866, was chief of the bureau of yards and docks 1869–71, and of the bureau of navigation till 11 Dec. 1877, when he was made rear-admiral on the retired list. He designed the Ammen life raft and the ram Katahdin. He wrote: 'The American Inter-Oceanic Ship Canal Question' (1880); 'The Atlantic Coast' (1883); 'Country Homes and Their Improvement'; 'The Old Navy and the New' (1891).

AMMERGAU, am'mer-gou, a district or *gau* on the river Ammer in upper Bavaria. The inhabitants are occupied in making figures of

saints, crucifixes, toys, etc., of wood, ivory and glass, from which a considerable trade arises, having its centre in the villages of Ober and Unter Ammergau. The former village is famous on account of the Passion Play (q.v.).

AMMETER. See GALVANOMETER.

AMMIANUS, Marcellinus, the last Roman historian of importance: b. Antioch about 325 A.D.; d. Rome about 398. He entered the army at an early age and served in several campaigns. Eventually he settled in Rome, where, at an advanced age, he wrote (in Latin) a history of the Roman Empire from the accession of Nerva to the death of Valens (96–378), thus forming a continuation of the work of Tacitus. This history was originally in 31 books; of these the first 13 are lost, the 18 which remain cover the period from 353 to 378. It is extremely valuable, being a clear, comprehensive and impartial account of events by a contemporary of soldierly honesty, independent judgment and wide reading. In his description of the Empire — the exhaustion produced by excessive taxation, the financial ruin of the middle classes, the progressive decline in the morale of the army — we find the explanation of its fall before the Goths 20 years after his death.

AMMON, an Egyptian deity, whose worship spread all over Egypt and other parts of north Africa, and many parts of Greece. The Egyptian hieroglyphic monuments call him Amun, the Greeks identified him with their supreme god Zeus, while the Romans regarded him as the representative of Jupiter. His worship centred in the Egyptian Thebes, which the Greeks therefore called Diospolis or the City of Zeus. He is represented as a ram, as a human being with a ram's head, or simply with the horns of a ram. His most celebrated temple was in the oasis of Siwah in the Libyan desert.

AMMON, Otto, German anthropologist and editor: b. Karlsruhe 1842. He was educated as a civil engineer and was engaged in that profession from 1863 to 1868. From 1868 to about 1883 he was a publisher and editor. In 1883 he engaged in literary work and made several investigations in anthropology and sociology. He is the discoverer of "Ammon's law," that the Teutonic race has everywhere manifested a tendency toward city life. He demonstrated this law by a series of measurements of physical characteristics among army conscripts. His investigations have shown radical differences in the form of the head in city and country and even between the upper and lower classes in the larger cities. He has written: 'Die natürliche Auslese beim Menschen' (Jena 1893); 'Die Gesellschaftsordnung und ihre natürlichen Grundlagen' (3d ed., Jena 1900); 'Zur Anthropologie des Badenes' (ib. 1899); 'Die Körpergrösse der Wehrpflichtigen in Baden, 1840–64' (Karlsruhe 1899); 'Anthropoligische Untersuchungen der Wehrpflichtigen in Baden' (1890); and "Die Geschichte einer Idee" (in *Rundschau,* Berlin 1896); "Der Abänderungsspielraum" (in *Natur-Wissenschaftliche Wochenschrift,* Berlin 1896); "Die Menschenrassen in Europa" (in *Rundschau,* Berlin 1896).

AMMONIA (supposed to be so called because originally prepared from the dung of camels near the temple of Ammon, in Egypt), a gaseous compound of hydrogen and nitrogen, having the formula NH_3. It may be formed in small quantities by the direct combination of its elements under the influence of the silent electric discharge; but in the arts it is commonly prepared by the decomposition of nitrogenous matter. Formerly it was manufactured in large quantities by the destructive distillation of horns, hoofs and hides, and from this fact it was known as "spirits of hartshorn." It is now chiefly obtained as a by-product in the manufacture of coal-gas. Coal suitable for the manufacture of gas contains nitrogen, often to the extent of 2 per cent of its weight; and in the distillation of such coal the nitrogen combines with a portion of the hydrogen that is also present, and is driven off in the form of ammonia; or more often it combines with the sulphur present and is obtained in the form of a sulphate. Salts of ammonia also occur in nature, sometimes in considerable quantities. In Tuscany ammonia sulphate is obtained as a by-product in the manufacture of boric acid. See BOUSSINGAULTITE; LARDERELLITE; MASCAGNITE.

Ammonia (NH_3) is a colorless gas at ordinary temperatures and pressures, but at 60° F. it condenses into a colorless and expansible liquid upon the application of a pressure of about seven atmospheres. At the freezing point of water a pressure of 4.4 atmospheres suffices to liquefy it; and at about 29° below zero, F., it condenses into a liquid at ordinary atmospheric pressure. Ammonia thus liquefied by pressure is much used, in the arts, for the production of low temperatures and the manufacture of artificial ice. (See REFRIGERATION). It freezes at about 103° below zero, F., into a white crystalline solid. Liquid NH_3 dissolves the alkali metals without chemical changes, forming blue solutions.

Ammonia gas is very soluble in water at ordinary temperatures, the solution constituting the so-called "ammonia" or "aqua ammonia" that is familiar in every household. At 32° F. and at ordinary atmospheric pressure water will absorb 1,148 times its own volume of NH_3; and at 68° F. it will absorb 740 times its own volume.

Both ammonia gas and its solution in water possess strongly alkaline properties, turning red litmus paper blue and combining with acids to produce definite salts. The solution of ammonia gas in water is attended by a considerable development of heat, and it is usual to consider that a definite compound of ammonia and water is formed. The formula of this compound may be written $NH_3.H_2O$, but many considerations suggest that $NH_4.OH$ is a better and more logical form. NH_4 is here considered to be a radical, analogous in its chemical deportment to the familiar alkali metals sodium and potassium. According to this view ordinary "aqua ammonia" would be regarded as a solution of the hydrate of the radical NH_4; and for many years past chemists have admitted the existence of such a radical, which they have called "ammonium." Upon adding hydrochloric acid to a solution of ammonia gas, a compound known as "sal ammoniac" is obtained, which is used largely in electric bat-

teries that are intended for open circuit work. The reaction by which this substance is formed may be written $NH_3+HCl=NH_3.HCl$; or if the existence of a definite hydrate in the "aqua ammonia" is admitted, we may write the reaction $NH_4.OH+HCl=NH_4.Cl+H_2O$, in which case the reaction is in all respects analogous to that by which potassium chlorid (for example) is formed when hydrochloric acid acts upon potassium hydrate: $KOH+HCl=KCl+H_2O$. All the other salts that are formed by the combination of ammonia with acids can be similarly expressed by admitting the existence of the radical NH_4 and treating it, in the formulæ, as though it were a metal of the alkali group. All the "ammonium" compounds are isomorphous with the corresponding potassium compounds.

Aqua ammonia, or "caustic ammonia" (as it is sometimes called), is used for many purposes in the arts, notably in the production of soda by the ammonia process (see SODIUM), and in dyeing and calico-printing. Large quantities of the sulphate are used in fertilizers and in the manufacture of ammonia alum (see ALUM). The chloride of ammonium is used (as above noted) in certain common forms of electric batteries, and also in soldering, in dyeing, and in many minor ways. The carbonate is largely used in the manufacture of baking powders and for scouring wool.

Ammonia is expelled from all of its compounds by quicklime, and the usual test for ammoniacal compounds consists in heating the substance to be examined, together with caustic lime or caustic soda or potash. If ammonia is present in any considerable amount it is liberated by this treatment and may be recognized by smell or by its action on litmus paper. Nearly all of the compounds of ammonia are batteries, and also in soldering, in dyeing, and the double platinic chloride being the chief exceptions.

Ammonia forms the starting point for an extraordinarily long list of compounds, many of which are exceedingly complicated. See AMIDE; AMINE.

AMMONIACUM is a gum resin derived from the stems of *Dorema ammoniacum*, a forest plant of Persia. Other species of *Dorema* yield similar products.

The plant has an abundant supply of milky juice which exudes spontaneously and hardens in various-shaped masses. Fine tears, varying in size from two to five mm. up to the size of a hazel-nut, are obtained from insect-punctured wounds, while the so-called *ammoniacum amygdaloides* is obtained from the root of the plant.

Ammoniacum consists of a mixture of varying proportions of ethereal oils, 1 to 2 per cent, resins, gums, 65 to 70 per cent; and pectin-like bodies. Ash 20 per cent. A certain amount of water is always found in the commercial product. The ethereal oils are found in small quantities only, generally less than 10 per cent. It is soluble in carbon disulphide. The resin is to be distinguished from other resins in that its alcoholic solution gives a red reaction when added to a bromide of sodium solution, 30 gr. NaOH in Aq. Br. 20 gr. Aq. 1 liter. Umbelliferon would seem to be absent.

AMMONITES, ăm'mŏn-ītz, or "children of Ammon." In the cuneiform inscriptions their land is called Bit-Ammān, as if Ammān were a personal name; but Genesis says Ben-ammi, and Ammi was perhaps a local god. Their land was in the eastern part of the district now called Belka, on the northeast of the Dead Sea next the desert; its capital Rabbah or Rabbath-Ammon. Their real history begins with Saul, though Jephthah the freebooter is said to have delivered Israel from them, and one tradition represents Balaam as an Ammonite — but this is thought a later excuse for excluding them from the Jewish body. They were in a state of chronic border warfare with the Hebrews, their close kinsmen, and speaking a closely related dialect. Nahash, King of Ammon, besieges Jabesh-Gilead (1 Sam. xi), and offers terms for its capitulation on condition of putting out the chief men's right eyes,— but Saul wins a crushing victory over the besiegers. David as Saul's enemy is well treated by Nahash; but when he takes Saul's place the old feelings are resumed. Hanun, the son and successor of Nahash, treats David's messengers of congratulation with gross contumely (2 Sam. x); David wins a victory over them and the Syrian allies they have called in, and exacts a frightful vengeance from them, putting his captives to the torture quite in the Assyrian fashion, and leaving us to infer that there was little to choose in savagery. They probably recovered their independence after Solomon's death. Later they were subjugated by the Assyrians, as the inscriptions of several kings evince. Under Jeroboam II they make incursions into Gilead and are blamed for inhumanity. After the Israelitish deportation of 734 they occupied the land of Gad; under Jehoiakim they are incorporated into Judah; under Zedekiah they are allied with him against Assyria, but seem to have drawn out in time for safety, and Israelitish fugitives find refuge with their King, Baalis. Later they intermarried with the Jews, and there was a village of them in Benjamin; Judas Maccabæus defeated them: but they were gradually absorbed by invading Arab tribes. Their great local god was Milcom.

AMMONITES, ăm'ō-nī'tēz, the general name for the fossil cephalopod mollusks of the order *Ammonoidea*, given originally because of a fancied resemblance of the coiled specimens first known to a ram's horn, the symbol of Jupiter Ammon. Subsequently it served as a generic name for a group, but this has been abandoned in the light of later information. The *Ammonoidea* are one of the two orders of chambered tetrabranchiate cephalopods, the other being the *Nautiloidea* (see NAUTILUS). Their remains are found fossil in marine Palæzoic rocks from the Devonian to the close of the Mesozoic Age. More than 5,000 species have been described, grouped into about 100 families, and these into nine sub-orders in two divisions, (1) *Intrasiphonata* and (2) *Extrasiphonata*. The first group contains a single primitive (Devonian) sub-order having the siphuncle dorsally situated; the second contains all the remainder, which agree in having the siphuncle ventral. The classification is based upon the complexly lobed pattern of the sutures, or lines of union between the septa or partition walls of the chambers and the outer wall of the

shell (See CEPHALOPODA). The shells of ammonites were typically coiled in a single plane and ran in size from an inch or two in diameter to two or more feet; but this varied greatly, even to partial or entire straightness. The surface of the shell, too, was in many cases smooth and polished or slightly ridged, while in others it was roughly ringed or covered with cross-lines, spikes and tubercles, in handsome variety. Some shells were so compressed as to have the proportions of a watch; while others were almost globose.

As Hyatt states, ammonoids experienced a progressive evolution from the early Devonian until the upper Juras, when the group reached its summit of importance and was represented in great numbers and variety in all parts of the world: that is, when it attained the summit of its evolution in complexity of structure, form and ornament. Ammonoids exist in great abundance in the rocks of this period in the western United States, especially those of the irregular group called Ceratites, which succeeded the Palæozoic Goniatites, and other primitive forms. The Jurassic ammonoids show a mixture of retrogression with some progressive features. "Part of their losses are regained by the evolution of the vast number of forms and modifications during this period, but there are numerous localized signs of retrogression, due perhaps to unfavorable surroundings." Indications of this kind occur sporadically throughout the Jurassic time and become general in the Cretaceous period. Many of the later forms were openly or grotesquely coiled, or coiled only when young, becoming nearly or quite straight when they grow older, as in Ptychoceras, Turriteles, Scaphites, etc. These degraded "old-age" types were evidently due to the waning forces of life or to disease, because similar though much less marked uncoiling of shells, due to unfavorable condition of the water, have been observed in the fresh-water Planorbis of Steinheim, Germany, and elsewhere. (See EVOLUTION; SENESCENCE). Hyatt thus infers that there was in the European seas, at least, a widespread unfavorable change in their physical surroundings, "similar to but more extensive than that which affected European forms during the Lower Oolite," and to this influence he ascribes the uncoiling of the shells of Spiroceras and its allies. At the close of the Cretaceous period the ammonoids entirely disappeared. We thus see in the vast and more or less complete and continuous series of these beautiful shells, in which the imperfections of the geological record are less marked than in other groups, the process of rise, culmination, decline, and death of a type, presenting also beautiful illustrations of the biogenetic law (q.v.). The type begins with infantile and larval forms, then evolves youthful, mature, and finally old age forms, which present in their simple and closely coiled shells a return to the original simplicity of the infancy and childhood of the type.

Concerning the animals which made the shells, nothing is known except by inference. The growth of the shell begins with the formation of the primitive conically-shaped shell called "protoconch," and then the secondary shell begins to grow and becomes coiled up in one plane. Like the nautilus the mollusk lived in the outer chamber of its shell, from which it periodically advanced. The aperture of this outer chamber was closed when the animal withdrew into it, either by a single horny plate (*anaptychus*) or by a pair of calcareous plates (*aptychus*). The very earliest appear to have been swimmers, like the nautiloids; but the great bulk of the ammonites undoubtedly lived gregariously alongshore, where they crawled about, carrying or partly dragging their shells, and searching for the animal food upon which they subsisted. The learned Zittell points out that their shells were proportionately less bulky than those of the nautiloids, and correspondingly less buoyant; and the probability is that they swam little and were rarely active. There is reason to believe that in the case of some species the eggs were retained within the shelter of the living-chamber until they hatched, and that the young remained there until somewhat grown. See GONIATITES.

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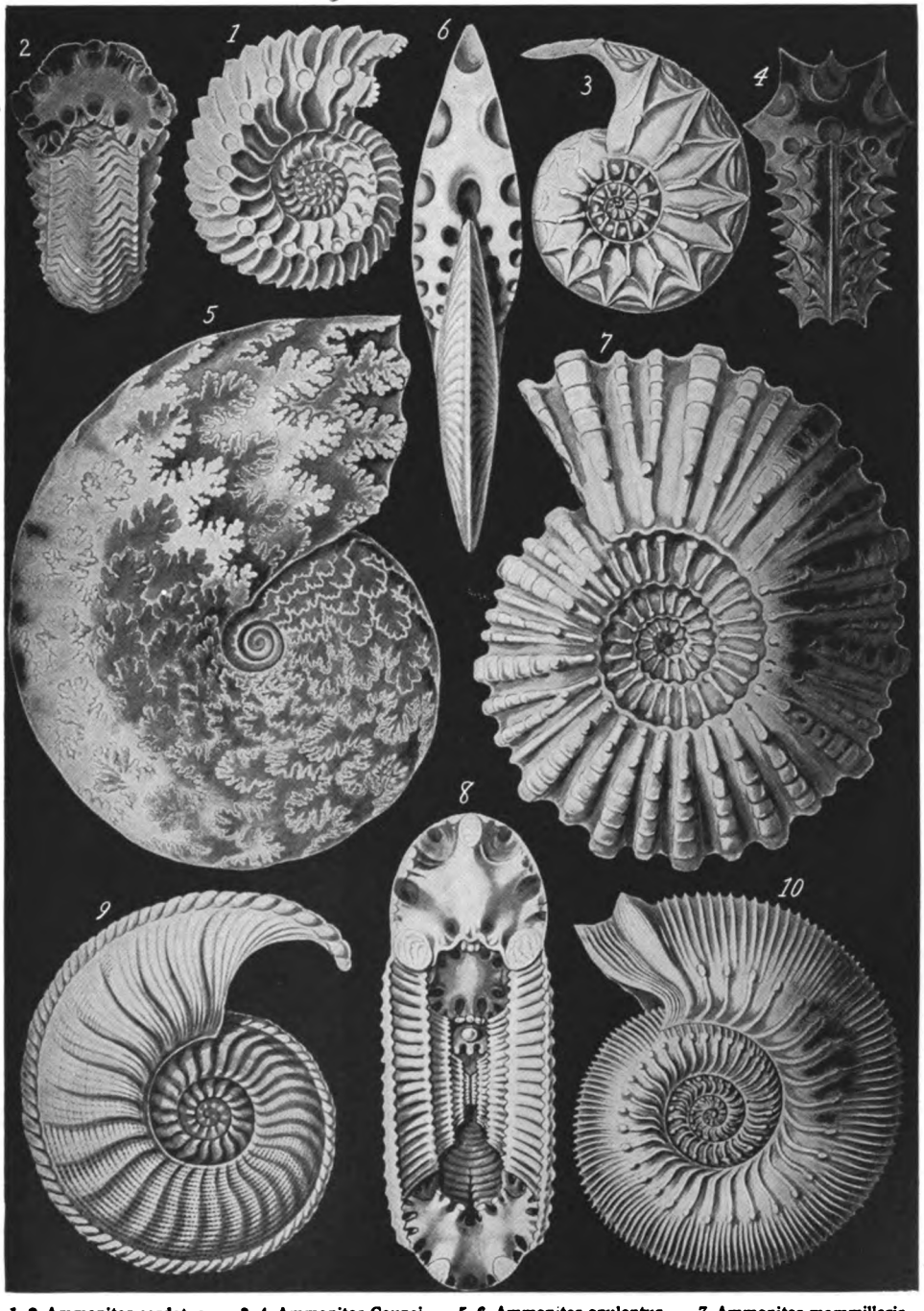
AMMONIUS SACCAS, a Greek philosopher who lived about 175–250 A.D. Originally a porter in Alexandria, he derived his epithet from the carrying of sacks of corn. The son of Christian parents, he abandoned their faith for the polytheistic philosophy of Greece; this is denied, however, by Eusebius and Jerome. His teaching was historically a transition stage between Platonism and Neo-Platonism and he may be regarded as the founder of the latter school. Among his disciples were Plotinus, Longinus, Origen the Christian, Origen the Neo-Platonist, Herennius, Antoninus, Theodosius, etc. He wrote nothing but his tenets were propagated by his pupils, especially by Origen, Herennius and Plotinus.

AMMONOIDEA, an order of tetrabranchiate cephalopods. It contains more than 5,000 species, all of which are extinct and found in a fossil state in marine rocks of the Devonian, Carboniferous and Mesozoic ages in all parts of the world. It is akin to the Nautiloidea and was a crawler instead of a swimmer. Its especial interest consists in that it furnishes the best illustrations of evolution, the laws of growth and decline, of ontogeny and pylogeny. See AMMONITES; CEPHALOPODA.

AMMONOOSUC, the name of two small rivers in New Hampshire which rise in Coos County and flow in a southwest direction, emptying into the Connecticut River. The lower Ammonoosuc is about 100 miles long and the upper 75 miles long.

AMMOPHILA, a genus of grasses, common on sandy beaches of Europe and eastern North America, coarse perennials with running root-stocks. They are valuable as sand-binders, and are often planted on sand dunes to prevent drifting.

AMMONITES



1, 2 Ammonites cordatus 3, 4 Ammonites Coupei 5, 6 Ammonites opulentus 7 Ammonites mammillaris
8 Ammonites cavernosus 9 Ammonites rotula 10 Ammonites Humphryi

AMMUNITION. Ammunition is prepared at the various arsenals and by numerous private manufacturing companies. Bags of serge, in enormous number, are cut out and made, and filled to form the cartridges for large ordnance. Bags or tubes of paper are made and filled to constitute blank cartridges for small-arms; while the ball-cartridges are enclosed in thin copper cylinders. The tubes and combustibles for war-rockets and fuses are also manufactured. The cartridges for small-arms (rifles, muskets, carbines and pistols) are made in millions; since it is on those that the main offensive operations of an army depend. It has been calculated that an army of 60,000 men, comprising a fair average of infantry, cavalry, artillery and engineers, ought to be provided with no less than 18,000,000 ball-cartridges for small-arms, for six months' operations. These would require 1,000 ammunition-wagons and 3,600 horses to convey them all at once. It is, therefore, deemed better that, under any such circumstances, there should be established *entrepôts* for supplying the troops from time to time. The wagons constructed for this kind of service will carry 20,000 rounds of small-arm ammunition each; the cartridges are packed in boxes, and the wagons are drawn by four horses each. Several wagons are organized into an "equipment," under the charge of a detachment of artillery, and there are several such equipments for an army of the magnitude above mentioned — one for each division of infantry, a small portion for the cavalry, and the rest in reserve. It has been laid down that an army of 60,000 men ought to have 2,680,000 cartridges *with them*, besides those in reserve; and that the conveyance of such a quantity, with a few forges and stores, would require 150 ammunition wagons, 830 men and 704 horses. The equipment would return to the *entrepôt* for a new supply when needed. In the Peninsular War, and at Waterloo, the English used two-horse carts, carrying about 10,000 rounds of small-arm ammunition each; but a superior kind of wagon has been since introduced. In the field, an infantry soldier usually carries about 60 rounds, put in compartments in his pouch.

The packing-boxes for field-ammunition are made of well-seasoned stuff (generally white pine), 1.25 inch thick, dovetailed with the tenon on the ends. The top of the box is fastened with six 2-inch screws. The box has two handles of 1¼-inch rope, attached to brackets at the ends. The boxes are painted on the outside different colors to indicate the contents of the box. Those containing shot are painted *olive;* shells, *black;* spherical case-shot, *red*; and canisters, a *light drab*. The kind of ammunition is marked on each end in large white letters. The place and date of fabrication are marked on the inside of the cover. The boxes are packed as follows:

For Smooth-bore Guns. Shot, spherical case and canisters, fixed.— Laid in two tiers across the box, the shot or canisters alternating with the cartridges at each side. The shot or canisters of the upper tier rest on those of the lower and not on the cartridges. Canisters are packed in the same manner, omitting the strips of wood in the bottom of the box.

For 12-PDR. Mountain-howitzer. Shells and cast-shot, fixed.— Placed upright, the balls down, resting on strips of wood as for the other howitzer. Canisters are packed in the same manner, resting on the bottom of the box.

For Rigged Guns. Shells and Case-shot.— Placed upright, the balls down, resting on strips of wood as for the howitzer. The iron part of the balls rests against strips of wood 4 inches wide and .25 inch thick, nailed to the side and ends of the box at the bottom, and similar strips placed between the row of the balls to prevent the soft metal cups from bearing against the box or against each other and being bruised; the cartridges are placed on top of the projectiles. Canisters are packed in the same manner as the case-shot, omitting the strips of wood on the bottom of the box. In all the boxes the small stories are placed in the vacant spaces on top of the ammunition. A layer of tow is placed in the bottom of each box, and the whole contents are well packed in tow, filling the box so as to be pressed down by the cover. About three pounds of tow are required for a box.

Ammunition is supplied to troops in campaign in the following manner: It is shipped from arsenals to ammunition depots at the base of operations; it is then carried by the line of communications to the advance supply depot and there delivered to the ammunition trains. The combat trains are replenished from the ammunition trains, though in exceptional cases issues from a supply depot may be made direct to combat trains. From the latter ammunition is delivered to the troops. At the beginning of a general engagement two wagon companies for each division engaged (including the cavalry division) are loaded — one with small arms and the other with artillery ammunition — and held in readiness at the advance supply depot.

Ammunition Trains.— The ammunition train of a full *division* is normally loaded as follows: (a) For small arms (three wagon companies, 81 wagons), 77 wagons, each with 25 boxes (1,200 rounds per box) of rifle and 1 box (2,000 rounds) of revolver ammunition, and 1 wagon with 300 boxes of revolver ammunition. (b) For artillery (2 wagon companies, 54 wagons), 51 wagons, each with 25 boxes (4 pounds per box), and 1 wagon with artillery stores. If available, caissons instead of wagons may be used for carrying artillery ammunition. Each caisson carries 106 rounds, or 48 caissons would carry about the same as 51 wagons. During combat the ammunition train takes station as ordered. It is generally in a protected position, near good roads if possible, where the empty battalion ammunition wagons or caissons can be replenished. It may be advisable to divide the train and assign the parts to different positions in rear of the line. A brigade commander may select a rendezvous station for the empty battalion ammunition wagons of his command and request that wagons from the ammunition train be sent to that place to refill battalion wagons. The position of an ammunition train, or detached part thereof, is marked by a *red* flag during the day, and by a *red* lantern at night.

Combat Trains.— The small-arms ammunition wagon (2 for each infantry battalion and 1 for each squadron) in addition to intrenching tools, etc., is usually loaded as follows: Infantry, 22 boxes of rifle ammunition; cavalry,

20 boxes of rifle and 4 revolver ammunition. Ammunition in the artillery combat trains is carried in caissons. Battalion commanders are charged with keeping their ammunition wagons properly filled and equipped.

As as rule, combat trains march immediately in rear of the battalion unit to which assigned, though when combat is not probable they may be assembled in rear of their respective regiments, or sent to join the trains.

Infantry.— The distribution of small-arms ammunition allows 330 rounds per rifle, with a reserve for machine guns, etc. Engineers or signal troops requiring ammunition draw from the nearest ammunition wagons. Cavalry and other men armed with both rifle and revolver carry in the belt 90 rounds of rifle and 20 rounds of revolver ammunition.

In campaign all officers and non-commissioned officers endeavor to keep the belts of their men filled with ammunition. Not only must advantage be taken of every opportunity to replenish the supply, but prospective expenditures must be anticipated by issuing ammunition in advance. As troops go into combat two bandoliers from the combat train are issued to each man, unless otherwise ordered. If additional ammunition is needed during the combat, the lead mules of battalion ammunition wagons may be converted into pack mules and ammunition delivered to the firing line in that manner. If this is impracticable, small squads of men under non-commissioned officers may be detailed to carry ammunition to special parts of the firing line, or reinforcements may be given extra ammunition for that purpose. If available the division pack train is used to carry ammunition to ground impracticable for wagons, or wherever it may be urgently needed.

Every lull in the fight must be utilized to renew the supply, and to equalize the same in each company. The contents of the belts of the dead and wounded are distributed whenever practicable, though the latter must not be left wholly without means of self-defense. *In no case are men sent to the rear for ammunition, if it can be obtained in any other manner.* When ammunition is running low, officers caution the men to reserve a few rounds each for emergencies. The morning following an engagement should find the firing line and all ammunition wagons replenished.

Artillery.— When the battery goes into action each piece is supplied from its own caisson. With the firing battery are two additional caissons from which the gun caissons are replenished. This replenishment is ordinarily effected by the cannoneers during lulls in the action. The ammunition in the gun limbers is kept intact as a last reserve, and whenever used is replaced as soon as practicable. The emergency ammunition on the guns is used only in extreme cases, and must be immediately replaced. Cassions from the reserve (combat train) replace empty caissons of the firing battery. Empty caissons are either refilled from the limbers of the reserve caissons or sent to the ammunition train to be refilled. If necessary, wagons or caissons from the ammunition train may be sent direct to the firing battery. Horse batteries in a cavalry action draw ammunition, when necessary, from the limbers; the ammunition so used should be replaced as soon as practicable.

Cavalry.—*Ammunition Train.*— The ammunition train of a cavalry division is normally loaded as follows: (a) For small-arms (2 wagon companies, 54 wagons)— 52 wagons, each with 20 boxes of rifle and 4 boxes of revolver ammunition. (b) For artillery (1 wagon company, 27 wagons)— 25 wagons, each with 25 boxes, and 1 wagon with 12 boxes and artillery stores. Rations, forage and the necessary intrenching tools are also carried, but the loads are kept as light as possible. The ammunition for a cavalry division is carried, distributed and replaced substantially as in the case of infantry, the cavalryman carrying 90 rounds of rifle and 20 rounds of revolver ammunition in the belt, and, when combat is imminent, 60 rounds of rifle and 20 of revolver ammunition in the saddle bags. Combat trains of cavalry acting independently generally march with the horse artillery, if any; otherwise in rear of their squadrons or regiments or with the ammunition train. As cavalry in campaign is liable to be separated from its combat and ammunition trains, it is authorized, in such emergencies, to draw from the most available ammunition wagons or source of supply. The use of pack animals is often necessary.

Ammunition Supply for a Field Army.— To replace ammunition used in combat an amount not less than that carried by the mobile forces should be kept at or near the advance supply depot, and an additional amount approximately equal to all ammunition in advance of the base should be available at the base of operations or other depots. This distribution, in rounds, is shown in the foregoing table. See CARTRIDGES; EXPLOSIVES; SHRAPNEL.

AMMUNITION SERVICE. This resembles the service of supply (q.v.), but differs in that no ammunition can be replenished by foraging. The ammunition service is organized by the field artillery, and its commander is directly under the commander of the latter. Ammunition on the man and on the caissons of the firing batteries is replaced by that carried in organization combat trains, which are ordinarily refilled from the divisional ammunition train, though they may be refilled from the line of communications. Economy and a continuous supply of ammunition must be obtained by the concerted efforts of all. The normal course of ammunition is from the railhead in the line of communications by the ammunition column to the refilling point, where the zone of active operations commences. From there it is transported to the distributing points by the ammunition train, which may be subdivided into two companies or battalions acting tandem, the one refilling from the other. From the distributing points it is brought to the separate organizations by their own combat trains. The whole organization continually advances as far as possible, bringing the distributing and refilling points to the front, and shortening the hauls of the combat and ammunition trains. Any part of the route indicated may be eliminated if circumstances permit: for instance, the refilling-point may be at the rail-head. In the present war, there is a tendency to replace the various units of the ammunition service, up to the heavier guns themselves and to the distributing points for infantry and some of the lighter guns, by narrow-gauge railways.

AMMUNITION TRAINS. See AMMUNITION.

AMNESIA, ăm-nē'zhi-ą. See APHASIA.

AMNESTY, an act of oblivion passed after an exciting political period. Express amnesty is one granted in direct terms. Implied amnesty is one which results when a treaty of peace is made between contending parties. Amnesty and pardon are very different. Amnesty is an act of the sovereign power, the object of which is to efface and to cause to be forgotten a crime or misdemeanor. A pardon is an act of the same authority which exempts the individual on whom it is bestowed from the punishment which the law inflicts for the crime he has committed. 7 Pet. (U. S.) 160. Amnesty is the abolition and forgetfulness of the offense; pardon is forgiveness. A pardon is given to one who is certainly guilty or has been convicted; amnesty, to those who may have been so.

AMNESTY PROCLAMATION. An act passed 25 Dec. 1868, granting amnesty to all who were guilty of treason against the United States or adhered to their enemies during the Civil War. This included domiciled aliens. But the proclamation did not entitle one whose property had been sold under the Confiscation Act of 1862 to reclaim the proceeds after they had been paid into the treasury of the United States.

AMNION. See EMBRYOLOGY.

AMŒBA, or **PROTEUS ANIMALCULE,** a protozoan classified as one of the rhizopods, which is present almost everywhere in fresh water, and sometimes in moist earth, and is commonly taken as the type of the unicellular animals. It is a mere drop of animated jelly (protoplasm, q.v.), hardly visible to the unaided eye, which under the microscope is seen to be divisible into an inner granular mass (endosarc) and an outer clearer part or envelope (ectosarc); but there is no essential difference in substance between them. Imbedded in the interior granules is a large spherical globule, the nucleus, consisting of a clear chromatic substance containing minute granules of chromatin. A contractile vacuole lies in the ectosarc, and manifests more or less regular and rhythmical expansions and contractions; this seems to serve the purpose of an excretory organ. The amœba continually throws out irregular threads and extensions (pseudopods), so that its shape is more often like that of a drop of any thick liquid which has fallen and spattered, than of a globule; this shape is changing incessantly as the creature slowly creeps about. Whenever it touches any edible particle of organic material it slowly enfolds it, and the particle sinks into the body, where it is gradually dissolved, its nutritive material is digested and assimilated, furnishing food and fuel to the protoplasm, and the innutritious parts are finally gathered into the vacuole, whence they are squeezed out and discarded.

Amœba reproduces itself by a simple process of division. A constriction takes place at a point where the nucleus will be divided, and goes on until the animal becomes dumbbell-shaped. Finally the two parts separate, and each becomes a distinct and perfect whole, each with its half of the original nucleus, which at once becomes, in each case, a whole nucleus. After a time these individuals in turn undergo a similar division and so on. It may therefore be said that amœba never ceases to exist — never dies; but simply multiplies indefinitely by repeated divisions.

Certain forms of *Amœba,* notably *A. coli,* are the cause of a distinct kind of dysentery now termed amœbic dysentery. This is a disease mostly of the tropics, but is also found endemic in the United States. Occasionally the parasite may infect the liver, causing an abscess in that organ. The disease is difficult to treat.

AMON-RÉ, a-mŏn-rā (originally RÉ and later AMON RÉ), the national god of Egypt during the greater part of its history. His worship was a form of sun-worship. The insignia of the god was the "solar disc encircled by the poisonous uraeus serpent." In the 12th dynasty, to strengthen the hold of Thebes on the country, the local Theban divinity Amon was transformed into the sun-god Amon-Rē. His worship extended beyond the confines of Egypt. Thebes was the centre of the worship and for a time his high-priests were the rulers of Egypt. His consert was Mut, the mother of the gods.

AMONTONS, ą'mŏn-tŏn', **Guillaume,** French experimental philosopher: b. Paris, 31 Aug. 1663; d. there, 11 Oct. 1705. He devoted himself particularly to the improvement of instruments employed in physical experiments. In 1687 he presented to the Academy of Sciences an hygrometer of his own invention, and in 1695 he published his only book 'Remarques et expériences physiques sur la construction d'une nouvelle clepsydre, sur les baromètres, les thermomètres et les hygromètres. In 1699 he published some investigations on friction, and in 1702–03 two noteworthy papers on thermometry. He experimented with an air-thermometer, in which the temperature was defined by measurement of the length of a column of mercury; and he pointed out that the extreme cold of such a thermometer would be that which reduced the "spring" of the air to nothing, thus being the first to recognize that the use of air as a thermometric substance led to the inference of the existence of a zero of temperature. In 1704 he noted that barometers are affected by heat as well as by the weight of the atmosphere, and in the following year he described barometers without mercury, for use at sea.

AMOR, the god of love among the Romans, equivalent to the Greek Eros. He had no place in the national religion of the Romans, who derived all their knowledge of him from the Greeks. According to the later mythology Amor is the son of Venus and Mars, the most beautiful of all the gods; a winged boy with bow and arrows, sometimes represented blindfolded. His arrows inflict the wounds of love, and his power is formidable to gods and men. He is not always a playful child in the arms of his mother, but appears sometimes in the bloom of youth, for example, as the lover of Psyche. He is brother of Hymen, the god of marriage, whom he troubles much by his thoughtlessness. According to the earlier mythology he is the oldest of all the gods, and existed before any created being. In English the

god of love is less frequently called Amor than Cupid; yet with the ancients *cupido* denoted, properly, only the animal desire.

AMORGOS, ą-mōr'gōs, an island in the Grecian Archipelago, one of the eastern Cyclades, 22 miles long, five miles broad; area, 106 square miles; has a town of the same name, with a castle and a large harbor. Pop. 5,000.

AMORITES. Though made a separate tribe in the varied and rhetorical lists of the peoples in Canaan ousted by the Israelites, the name is used by Amos in the 8th century as a general term for the primitive inhabitants of Canaan, with attribution of gigantic size and power, as most old nations do with their special aboriginal predecessors. Some critics think, however, that "Canaanite" is used for the peaceful settlers of the plains, and "Amorite" for the warlike tribes on the hills to the north. At any rate, the latter term is always used when hostile tribes are meant. Moses' foes include Sihon and Og, the Amorite kings, and Joshua deals with 12 kings of the Amorites west of the Jordan. The Amarna letters show that the coast as far north at least as Sidon was called Kinahi (Canaan), and perhaps the Amorites were the people of the interior; but the usages, may be due to the writers coming from different sections.

AMORPHISM, a term used in chemistry and mineralogy to denote the absence of regular or crystalline structure in a body.

AMORTIZATION, (1) the act of satisfying, liquidating or reducing, as a debt, usually by a sinking fund. The term has a wider application and is more commonly used recently in this sense than formerly. It is often applied to securities in figuring their investment value. For instance, if a security is bought at a premium or at a discount, a part of the premium is charged off or a part of the discount is credited so as to bring the value of the security to par at maturity. In each case the transfer is made from investment to income or the reverse. Another common application of the term in this sense is to investments having a life of limited duration, as mines. Dividends on such investments are treated not only as interest on capital but also as the return of capital itself. As an illustration, if securities in a mine are purchased and such securities yield an annual dividend of 12 per cent, 6 per cent may be treated as income and 6 per cent as return of capital. If the 6 per cent treated as return of capital is again invested at 4 per cent interest, a simple mathematical calculation will determine the number of years required for the return of the investment originally made. The term is also often applied to the paying off of a mortgage by instalments or by a sinking fund.

(2) The sum applied to satisfying, liquidating or reducing, as a debt.

(3) The alienation of lands to a corporation having perpetual succession; the conveyance of lands in mortmain. Formerly this was applied to ecclesiastical corporations only, but later it was applied to any corporation which by its nature could be perpetual. Alienation of lands to corporations is governed by statute in Great Britain and in some States in this country.

AMORY, Blanche, a shallow, selfish, worldly girl in Thackeray's novel 'Pendennis.'

AMORY, Robert, physician: b. Boston, 3 May 1842; d. 1910. He was graduated at Harvard 1863, M.D. 1866, and studied in Paris and Dublin. He was lecturer at Harvard on the physiological action of drugs 1869; then professor of physiology at Bowdoin Medical College till 1874. Auther of 'Bromides of Potassium and Ammonium' (1872); 'Action of Nitrous Oxide' (1870); and important papers on 'Chloral Hydrates,' 'Pathological Action of Prussic Acid' and 'Photography of the Spectrum'; the volume on 'Poisons' in Wharton & Stillé's 'Medical Jurisprudence'; and 'Electrolysis and Its Applications to Treatment of Disease' (1886).

AMOS, a prophet of ancient Israel, lived in the middle period of the 8th century B.C. His home was Tekoa, a mountaintop village about 12 miles south of Jerusalem, on the border of the wilderness. The prophet described himself as a sheep raiser and a tender of sycomore fig trees, denying all connection with the sons of the Prophets. Though a citizen of Judah, Amos preached at Bethel, one of the royal sanctuaries of northern Israel, in the latter half of the prosperous reign of Jeroboam II (2 Kings xiv, 23–29). He is the earliest of the "writing prophets," i.e., those whose oracles have been preserved as separate books.

The book of Amos is made up of (1) An opening address to the throng at the Bethel sanctuary (Chaps. i-ii). (2) A group of three addresses each beginning "Hear this word" (Chaps. iii–vi). (3) A series of symbolic visions with mingled exhortations (Chaps. vii–ix), and an historical statement (vii, 10–17). The book is thus one of the most systematically arranged of all the Prophets and, at the same time, exhibits the variety of structure that enters into the composition of the prophetic writings — oratory in poetic form and diction, a bit of song (v, 2), symbolic vision, biographical narrative. Expressing himself in pure, clear Hebrew, the writer is a master of vivid illustration from nature and history, of rhythmical period or terse antithesis, of emotional appeal and concrete picturing of facts. In the pages of this tiny book the horrors suffered by the people of the east-Jordan districts, over whose territories the wars of Israel and Damascus had raged in former reigns, are still most vivid, while the vices of Israel in Jeroboam's victorious reign are most realistically presented. Bribery in the law courts, dishonesty of the merchants with their false balances and measures, oppression of the poor to secure the means for the coarse or elegant indulgences of the newly rich and their gross wives are some of the social conditions pictured as existing in conjunction with abundant ritual of sacrifice and music, and outward observance of sacred days. With the skill of a consummate orator Amos could lead his hearers on from accepted and congenial truths to new and unwelcome ideas, or could turn from concrete description of hard fact to symbolic vision.

The message of Amos by its originality and significance marks one of the greatest advances

in religious history. Now for the first time the God of Israel is clearly presented as the God of nations who will punish injustice done by Moab to Edom as well as that done by Edom to Israel, and who uses the warring nations of the world to carry out his own righteous purposes. This great God of history is also conceived as one whose essential service consists in righteous conduct toward men rather than in worship through sacrifices or any form of ceremonial. As a corollary of such conceptions, Israel's past privileges are counted ground of her greater responsibility rather than earnest of greater material blessings. Earlier teachers had made ethical demands in the name of Jehovah, but Amos first clearly pictures him as the just God of nations whose primal demand is for justice in economic and international relations.

The book of Amos has suffered relatively less expansion by subsequent hands than many of the Prophets. The principal section generally regarded as a later addition is ix, 8–15.

Important recent commentaries are those of G. A. Smith, 'Book of the Twelve' (in 'Expositor's Bible'), and W. R. Harper, 'Amos and Hosea' (in 'International Critical Commentary'). The book is discussed in the Old Testament Introductions of Driver, Cornill, McFadyen, Creelman, in Fowler, 'History of Literature of Israel,' and in the recent Bible dictionaries.

HENRY T. FOWLER,
Professor of Biblical Literature, Brown University.

AMOY, ą-moi', China, a city and treaty-port in the province of Fuh-kien. It is a large and exceedingly dirty place, about nine miles in circumference, and is divided into two portions, an inner and an outer town, which are separated from each other by a ridge of hills, on which a citadel of considerable strength has been built. It possesses two commodious harbors. There are dry-docks and an excellent anchorage. The chief articles imported are sugar, rice, raw cotton and opium, as well as cotton cloths, iron goods and other European manufactures. The chief exports are tea, porcelain and paper. The trade carried on by means of Chinese junks is said to be large, and the native merchants are considered to be among the wealthiest and most enterprising in China. The annual imports are about $10,000,000; the exports $2,000,000. The falling off of exports in recent years is due to the decreased demand for China tea, for which Amoy was one of the chief centres. Amoy was captured by the British in 1841, after a determined resistance, and is one of the five ports that were opened to British commerce by the treaty of 1842. It is now open to the ships of all nations. The native population is now estimated at 300,000, and the foreign residents number about 300.

AMPELOPSIS, a genus of woody vines of the family *Vitaceæ*, consisting of about 20 species in North America and Asia. The plants have simple or divided leaves, small greenish flowers in cymes, and small, variously colored, grape-like berries. Several of the species, especially *A. humulifolia, A. japonica* and *A. heterophylla*, all natives of Asia, are commonly cultivated for covering walls and trellises. *A. arborea*, the pepper vine, of the southern United States and Mexico, is sometimes cultivated.

AMPERE, ăm-pār', **André Marie,** French physicist and mathematician: b. Lyons, 22 Jan. 1775; d. Marseilles, 10 June 1836. His father was guillotined in 1793, which tragedy had its influence on all his after life. In 1801 he was appointed professor of physics in the Central School at Bourg. Later he was called to Paris, where he served as teacher in the Polytechnic School. In 1814 he was elected a member of the Academy of Sciences and 10 years later he was appointed professor of experimental physics in the Collège de France. Science is largely indebted to him for his electro-dynamic theory and his original views of the identity of electricity and magnetism. He was also the inventor of the astatic needle, which made possible the modern astatic galvanometer. He was the first to show that two parallel conductors, carrying currents traveling in the same direction, attract each other, while if traveling in opposite directions they repel each other. He formulated the theory that there were currents of electricity circulating in the earth in the direction of its diurnal revolution which attracted the magnetic needle. The ampère, or unit of strength of an electric current, is named from him. His works are: 'Sur la théorie mathématique de jeu' (Lyons 1802); 'Recueil d'observations électro-dynamiques' (Paris 1822); 'Théorie des phénomènes électro-dynamiques' (Paris 1826).

AMPERE, International. See ELECTRICAL TERMS.

AMPERE TURNS, in problems concerning the magnetic field produced by a current in a coil of wire, the two necessary factors are the strength of the current in amperes and the number of revolutions or turns that the wire makes in forming the coil or solenoid. The product of these is termed ampere turns.

AMPEREMETER, ăm-pār'ē-mēt'ĕr, or **AMMETER,** am'mēt'er. An instrument for the measurement of electric currents in terms of the unit called the ampere. Since electric currents may be either continuous, i.e., unidirectional, or alternating, and the latter of high or of low frequency, amperemeters may be first divided into those (a) for continuous or direct currents, (b) for low frequency alternating currents, and (*c*) for high frequency alternating currents. A continuous electric current of one ampere is defined to be one which deposits electrolytically 0.001118 of a gramme of silver per second from a neutral solution of silver nitrate. An alternating current of one ampere is defined to be one which produces the same heat in a second in a wire as the unit continuous current defined as above to be one ampere. These definitions provide a basis on which the calibration of amperemeters can be conducted. They are therefore classified according to the physical principle on which they are constructed. An electric current is recognized by its ability (a) to create heat in a wire through which it passes, (b) to produce a magnetic field round the conductor or wire. The heat makes itself evident by raising the temperature and therefore elongating the wire, whilst the magnetic field creates mechanical

forces which act on pieces of iron or other conductors conveying electric currents when placed in proximity to the conductor in question. Hence ammeters are classified into (a) Thermal; (b) Electromagnetic; and (c) Electrodynamic instruments.

AMPHIBIA, a class of back-boned creeping animals comprising the newts, frogs and toads, together with several extinct groups, which is classified between the fishes and the reptiles. The most prominent characteristic is indicated by the name, which refers to the fact that these animals are provided with a respiratory apparatus which enables them to breathe both water and air. It is not meant, however, that the *Amphibia* are able to breathe in either air or water at the same time, but that the young are provided with gills and live in water up to a certain age, or in rare cases permanently, after which they acquire lungs and thereafter breathe atmospheric air. As these young as a rule are different from their parents and must undergo metamorphosis from the larval into the adult condition, amphibians as a class are usually said to undergo metamorphosis, but this is equally true of some fishes and it is not true of all amphibians. The evidence not only of modern similarity of structure, but that obtained from a study of the fossil forms, makes it plain that the *Amphibia* are the result of the evolution of a branch from an ancient fishstock, probably by way of the lung-fishes or *Dipnoi* (q.v.). On the other hand they are related in a not very different degree to the reptiles. The connection link, according to Gadow, is formed by the *Stegocephali;* all the recent orders are far too specialized. The line leading from *Stegocephali* to fossil reptiles is extremely gradual, and the same consideration applies to the line which leads downward to the fishes; but the great gulf within the *Vertebrata* lies between fishes and amphibians, that is, between absolutely aquatic creatures with internal gills and fins, and terrestrial four-footed creatures with lungs and fingers and toes. No great phylogenetic importance attaches to the possession of external gills, as it is not unlikely that in the *Amphibia* these organs owe their origin to entirely larval requirements.

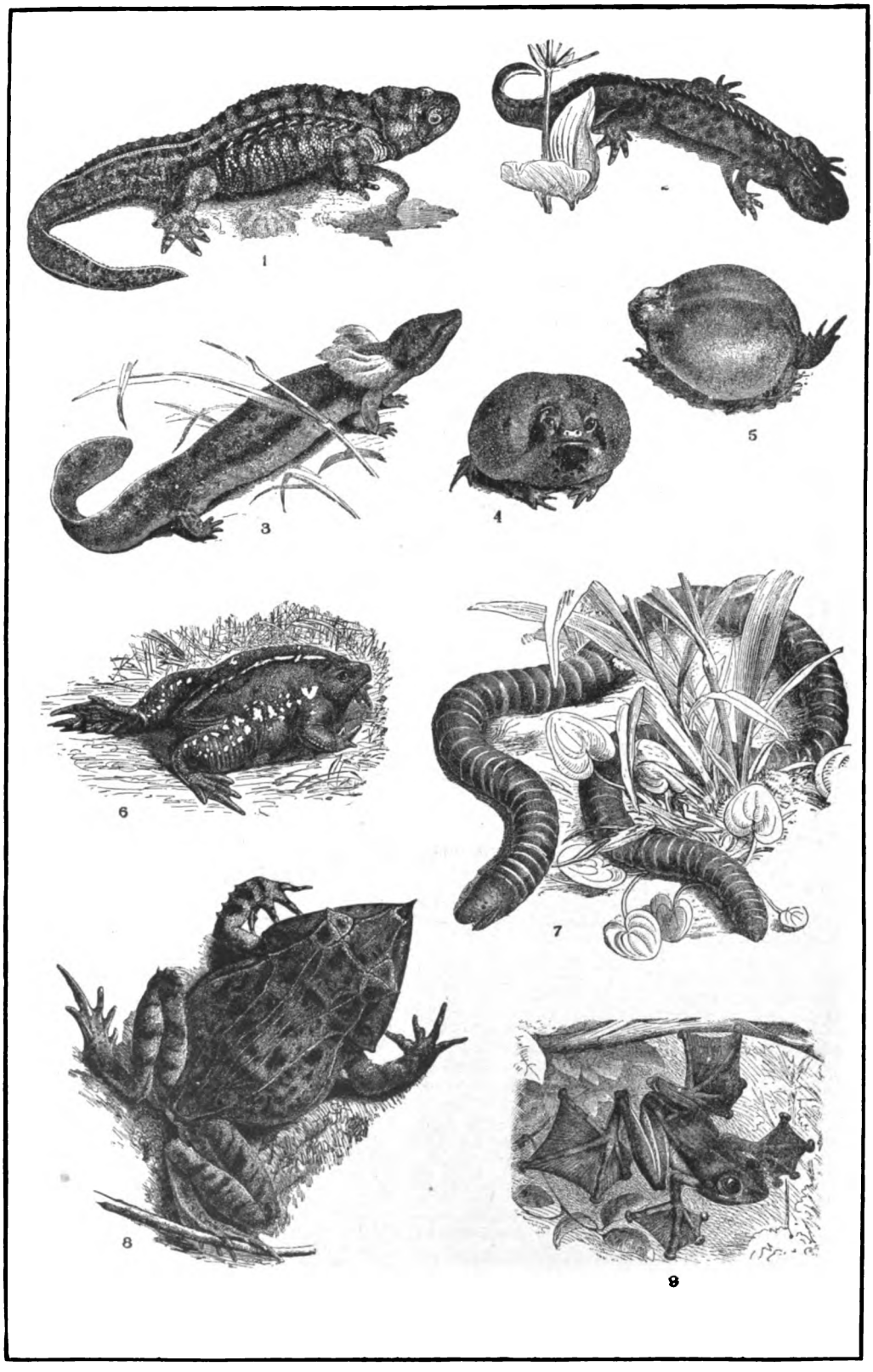
Although in the Palæozoic age the great stegocephalous amphibians (more usually called labyrinthodonts, q.v.), flourished as the only terrestrial vertebrates of importance, the class never attained a dominant position. Intermediate between the aquatic fishes and the gradually rising terrestrial reptiles, the amphibians were pushed aside in a double way by the struggle of evolution, until now most of them have become extinct. The remainder persist only because they have found shelter in the nooks and corners of the world to which they have become adapted by small size and aquatic habits; and only one group, the frogs and toads, fortunate in their plasticity, have spread over the whole globe and exhibit some richness in forms.

The class *Amphibia* is divided into two subclasses: (1) *Stegocephali* (q.v.), which is wholly extinct; (2) *Lissamphibia,* which includes all of the modern forms, contained in three orders: (1) *Apoda,* or *Gymnophiona,* composed of the family *Cœcilliidæ* (see CŒCILIAN); (2) *Urodela,* including the long-tailed, smooth-skinned, aquatic salamanders, newts, mud-puppies and the like; (3) *Anura,* comprising the tailless forms, or frogs and toads, of which there are two divisions,—the few *Aglossa,* which have no tongue, and the tongue-bearing *Phaneroglossa,* which includes the great majority of forms. The existing species number about 1,000.

Fossil Amphibia.— The modern frogs and salamanders are a small and scanty remnant of the *Amphibia* of Palæzoic time. During the Carboniferous and Permian periods they were the dominant form of life and of great variety in form, including some of very large size, 12 feet or more in length. All these ancient *Amphibia* belong to an extinct group, the *Labyrinthodonta* (sometimes called *Stegocephalia*), or "armored amphibians," distinguished by having the wide flat head completely roofed over with bone, and the body more or less armored with bony plates and scales. The skull has two openings for the eyes, two at the front margin for the nostrils and a single one in the middle for the pineal eye. Like modern amphibians, they breathed by gills when young, but by lungs when adult. All had long tails and most of them short, stout legs. Some were elongated and snake-like, others tadpole-like with large heads shaped like a broad arrow (*Diplocaulus*) and no limbs: others, and these the largest, heavy-bodied, with flat conical or semi-circular heads, short legs and five-toed feet (*Labyrinthodon, Eryops*).

These ancient amphibians illustrate various stages in the evolution of the backbone of modern *Vertebrata* from the notochord or segmented rod of cartilage from which it was derived. In the smaller and more primitive types the segments of cartilage are but slightly ossified in a number of separate plates or incomplete rings of bones. In others each vertebra is composed of two or four pieces, which remain separate during life instead of consolidating into a single bone, as in modern vertebrates. In others, again, the vertebra is completely united. The oldest known labyrinthodonts are from the Carboniferous rocks, and are related to some of the older Palæozoic dipnoan fishes, from which they may have been descended. In the Permian they attained large size and great abundance, and continued into the Triassic period, by the end of which they had become extinct. Their foot-tracks, often preserved in muddy sandstones of these periods, are sometimes curiously like the impressions of a human hand, whence they received the name of *Cheirotherium,* or "beast-with-a-hand," before their nature was recognized. The frogs and salamanders are probably descended from primitive labyrinthodonts, but are very little known as fossils. One fossil species, allied to the giant salamander of Japan, was found in the Miocene strata of Oeningen many years ago (1726) and was supposed by an early naturalist to be the fossil skeleton of a man, and described as "*homo diluvii testis et theoscopos*"—the man who was witness to the Deluge and saw God—a quaint reminder of the geological speculations of two centuries ago. For breeding habits, distinctive characteristics and modes of life see special articles under the various species. For good recent treatment of the Amphibians

AMPHIBIA



1 A Spanish Salamander (Pleurodires waltli)
2 European Crested Newt (Triton cristatus)
3 Menobranch (Necturus maculatus)
4–5 East African Toad (Breviceps mossambicus)
6 A Mexican Toad (Rhinophrynus dorsalis)
7 An Amphisbæna (Siphonops annulatus)
8 Horned Frog (Ceratobatrachus Guentheri)
9 Flying Frog (Rhacophorus pardalis)

consult Gadow, 'Amphibia and Reptiles' (London 1901); Boulenger, 'Catalogue of Batrachia' in British Museum (London 1882); and many papers in English scientific periodicals: Cope, 'Batrachia of North America' (Bulletin 34, United States National Museum, Washington 1889), which contains an extensive bibliography; also 'Amphibia,' by Lyddeker, Cunningham, Boulenger and Thompson (London 1912). Dickerson's 'The Frog Book' (New York 1916) gives a popular account of the group.

AMPHIBIOUS PLANTS. Certain plants, such as some liverworts, the knot-weed, *Polyganum amphibium, Sagittaria heterophylla,* the water-buttercup, *Ranunculus aquatilis,* and the mermaid-weed, *Proserpinacea. pallustris,* can grow and flourish either in water or in air; and are consequently called *amphibious.* The same plant will often assume great difference of form in the two environments. This is especially shown in the leaves. Those of *Polygonum amphibium,* hairy in air, are smooth in the water. *Sagittaria* has ordinary leaves in the air, but phyllodes in the water. *Ranunculus* and *Proserpinacea* have dissected leaves in the water, but leaves of the familiar broad-bladed form on land, with transitional forms at the surface of the water. It has been shown that the stimulus which produces this change in leaf-form is the transpiration which the leaf undergoes in air. Stems growing under water become flaccid at the surface, and the same plant which in the air has strength enough to hold itself erect will depend in the water on the surrounding medium for its support. Consult Coulter, J. M., Barnes, C. R., and Cowles, H. C., 'A Text-Book of Botany' (Vol. II, New York 1911).

AMPHIBOLE, am'fi-bōl (from the Greek *amphibolos,* "doubtful," in allusion to the difficulty of distinguishing it from pyroxene). In mineralogy, (1) a common mineral, crystallizing in the monoclinic system, and varying greatly in chemical composition. The name was first given by Haüy in 1801 as distinguishing a species of which he regarded hornblende and actinolite as varieties. In 1809 he included tremolite also. In general, the species may be described as a normal metasilicate of calcium and magnesium, associated with iron, manganese, sodium, potassium and hydrogen.

(2) **Amphibole Group.**— An important group of minerals, including the species described above, and taking its name therefrom. Its constituent species are widely different in chemical composition, and are closely allied to the members of the pyroxene group. All the species of the amphibole group have a prismatic cleavage of from 54° to 56°, and they also exhibit close relationships in the optical properties. All the species of the pyroxene group have a fundamental prism with an angle of 93° and 87°, the corresponding angle in amphibole being 56° and 124°. The specific gravity of the pyroxenes is usually higher than that of the species of the amphiboles with which they are likely to be confused. Alkalis are met with more commonly in the amphiboles, and magnesium is also more prominent in that group. The amphibole group is divided into three main sections according to the crystalline forms of its species. Dana's classification is as follows:

A. Orthorhombic Section.
  Anthophyllite.
  (Gedrite).
B. Monoclinic Section.
  Amphibole:
    Non-aluminous varieties:
      Tremolite.
      Actinolite.
      Cummingtonite.
      Dannemorite.
      Grünerite.
      Richterite.
    Aluminous varieties:
      Edenite.
      Pargasite.
      Hornblende.
  Glaucophane.
  Riebeckite.
  Crocidolite.
  Arfvedsonite.
  (Barkevikite).
C. Triclinic Section.
  Ænigmatite.

AMPHIBOLOGY, an equivocal phrase or sentence, not from the double sense of any of the words, but from its admitting a double construction, as "The duke yet lives that Henry shall depose." The word *that* may be ambiguous, and consequently the sentence may be an example of equivocation, not amphibology. Fallacies of amphibology are purely verbal, and seldom found apart from other types of verbal fallacy. They are so obvious that they do not constitute a serious source of unsound thinking.

AMPHICTYONIC LEAGUE or **COUNCIL,** in ancient Greece, an assembly composed of deputies from 12 Greek tribes, each of which sent two deputies, who assembled each year at Delphi, and again at Thermopylæ, with great solemnity; composed the public dissensions, and the quarrels of individual cities, by force or persuasion; punished civil and criminal offenses, and particularly transgressions of the law of nations and violations of the temple of Delphi. It forbade the destruction of a city of the league or the obstruction of its water-supply in war or peace. After the decision was published a fine was inflicted on the guilty state, which, if not paid in due time, was doubled. If the state did not then submit, the whole confederacy took arms to reduce it to obedience. The assembly had also the right of excluding it from the confederation. An instance of the exercise of this right gave rise to the Phocian War, which continued 10 years (B. C. 355–346). The council also administered the Pythian games. Consult Tittmann, 'Über den Bund der Amphyctyonen' (Leipzig 1880); Freeman, 'History of Federal Government' (2d ed., London 1893).

AMPHICYON, a genus of extinct mammals, found fossil in Miocene rocks, which is usually placed among the extinct *Canidæ* (dogs), but has many bear-like features, such as plantigrade, five-toed feet and the structure of the ulna and radius. The largest species was about the size of a bear, but with a very dog-like head. It belonged to the Old World, but a closely allied American Miocene form is *Daphænus.*

AMPHINEURA. See Mollusks.

AMPHION, in Greek mythology, son of Zeus and Antiope, his twin brother being Zethus. He is represented as being the oldest of

the Grecian musicians. In Lydia, where he married Niobe, the daughter of King Tantalus, he learned music and brought it thence into Greece. He reigned in Thebes, which he partly built, and it is said that at the sound of his lyre the stones voluntarily formed themselves into walls; also that wild beasts, and even trees, rocks and streams followed the musician. With the aid of his brother Zethus he is said to have avenged Antiope, who had been imprisoned and ill-used by his father, and to have bound Dirce, his stepmother, to the horns of a wild bull. This incident is supposed to be represented by the famous piece of sculpture, the Farnese bull, in the Farnese Palace at Rome.

AMPHIOXUS, the lancelet, a small animal of the marine sub-phylum *Cephalochordata,* of the great phylum *Chordata* (q.v.), to which the vertebrates belong. Its scientific name is *Branchiostoma.* From its somewhat worm-like form it was for a long time regarded as a worm by some authors and originally as a mollusk (*Limax*) by Pallas. It is now named *Branchiostoma lanceolatum;* lives buried in the sand just below low-water mark, the head or "oral hood" projecting above into the water. It also swims in a vertical or upright position, also frequently lying on one side on the sand; and burrows head foremost rapidly downward in the sand. It extends along our coast from the mouth of Chesapeake Bay to Florida; also on the eastern coast of South America and in the north European seas, the Mediterranean, the East Indies and Australasia, the species being truly cosmopolitan. Another very closely allied genus, *Asymmetron,* includes two species, one of which occurs at the Bahamas and the other in the Louisade Archipelago, southeast of New Guinea.

The body of *Amphioxus* is about two inches in length, slender, compressed, pointed at each end, hence the generic name (*Amphioxus,* *αμφὶ* both, *οξὺς,* sharp), the head-end being thin and compressed. The 62 v-shaped muscular segments are distinct to the naked eye. and alternate on the two sides. From the mouth to the vent is a deep ventral furrow and a slight dorsal fin extends along the back and beneath as far front as the vent, forming the ventral fin, while the wider portion at the tail is the caudal fin. The oral hood has a large median external opening, which is oral, surrounded with a circle of ciliated tentacles supported by semi-cartilaginous processes arising from a circumoral ring. At the bottom of this opening is the small mouth which leads directly into a large broad pharynx or "branchial sac," protected at the entrance by a number of minute ciliated lobes. The walls of this sac are perforated by long ciliated slits, of which there are more than a hundred pairs, comparable with those of the branchial sacs of ascidians and of *Balanoglossus.* The water which enters the mouth passes out through these slits, where it oxygenates the blood and enters the peribranchial cavity, thence passing out of the body through the abdominal pore (atriopore). The pharynx leads to the stomach with which is connected the liver or cœcum. There is a system of blood-vessels, but no heart. A contractile median vessel, the ventral aorta, beginning at the free end of the liver and extending along the underside of the pharynx, sends branches to the sac and two anterior branches to the dorsal aorta. On the dorsal side of the pharynx the blood is collected by the two anterior trunks from the branchial veins which carry away the aërated blood from the branchial bars, and poured into a great longitudinal trunk or median dorsal aorta, by which it is distributed throughout the body. There are also vessels distributed to the liver, and returning vessels, representing the portal and hepatic veins. The blood-corpuscles are white and nucleated.

The vertebral column of the true vertebrates is represented in the lancelet by a notochord, a long, flexible, cylindrical rod pointed at both ends, which extends to the end of the head far in front of the nervous cord. The nervous cord is a rod-like structure which lies over the notochord. It is not divided into a true brain and spinal cord, though the cord is slightly enlarged at the anterior end, where a rudimentary ventricle is said to exist. The nerve-cord sends off a few nerves to the periphery, with a nerve to the single minute median eye. An olfactory pit opens externally on the left side of the snout and communicates with the central canal of the nerve-cord. The principal excretory organs are about 90 pairs of peculiarly modified nephridia, situated above the pharynx and in relation with the main cœlomic cavities. These have no common duct but empty into the peribranchial cavity. The reproductive glands are square masses or pouches, of which there are about 26 pairs attached in a row on each of the walls of the body-cavity. The individuals may be male or female, the only sexual differences being in the reproductive glands.

The eggs may pass out of the mouth or through the pore. Kowalevsky found them issuing in May from the mouth of the female and fertilized by spermatic particles likewise issuing from the mouth of the male. The eggs are very small, 0.105 millimetres in diameter. The eggs undergo total segmentation, leaving a segmenta on cavity. The body-cavity is next formed by invagination. The blastoderm now invaginates and the embryo swims about as a ciliated gastrula. The body is oval and the germ does not differ much in appearance from a worm, starfish or ascidian in the same stage of growth. No vertebrate features are developed. Soon the lively, ciliated gastrula elongates, the alimentary tube arises from the primitive gastrula cavity, while the edges of the flattened side of the body grow up as ridges, which afterward, as in all vertebrate embryos, grow over and enclose the central nervous system. When the germ is 24 hours old it assumes the form of a ciliated flattened cylinder and now resembles an ascidian embryo, there being a nerve cavity with an external opening which afterward closes. The notochord appears at this time. In the next stage observed the adult characters have appeared, the mouth is formed, the first pair of gill-openings are seen, 11 additional pairs appearing. It thus appears that while the lancelet at one time in its life presents ascidian features, yet, as Balfour states, "all the modes of development found in the higher vertebrates are to be looked upon as modifications of that of

Amphioxus.» Consult Willey, A., 'Amphioxus and the Ancestry of the Vertebrates' (New York 1894). Any work on the Chordates or Vertebrates will contain some material on Amphioxus.

AMPHIPODA, an order of Crustacea, in which the body is compressed and usually arched. There is no carapace or distinct cephalothorax, but a small head, bearing two pairs of antennæ, a pair of jaws (mandibles), and three pairs of maxillæ. The thoracic segments are separate and like those of the abdomen, not being fused and united with the head segments. Respiration is performed by lamellate or leaf-like gills arising from the thoracic feet. The three anterior abdominal segements bear swimming feet, while the three posterior bear posteriorly directed feet adapted for springing. The heart lies forward, and the eyes are simple. The amphipods are represented by the common beach-flea or beach- or sand-hopper (*Orchestia agilis*); by Gammarus, or «scud,» species of which live both in the sea and in fresh-water. Extreme forms are the ghost-like or skeleton-like attenuated *Caprella,* abounding in eel-grass below low tide; and which in walking loop the body somewhat like a geometricid caterpillar. Another form is *Chelura terebrans,* which burrows in wood, in company with the gribble. It is very active and frequently destructive to submerged piles. Other forms are eyeless and live in caves or dark wells.

AMPHIPOLIS, an important city of Thrace or Macedonia; at the mouth of the Strymon River, 31 miles from the Ægean. It was founded as an Athenian colony about 436 B.C.; was captured by Sparta in 424 B.C.; and near it the Spartans defeated the Athenians in 422 B.C. in a battle in which Cleon, the Athenian general, and Brasida, the Spartan conqueror of Amphipolis, were both killed. Subsequently it became a Macedonian possession; was called Popolia in the Middle Ages; and its site is now occupied by the Turkish town of Yenikeui.

AMPHISBÆNA, one of the degraded worm-shaped lizards of the family *Amphisbænidæ,* which lead an entirely subterranean life, burrowing like earth-worms. They have a soft skin forming numerous rings and containing only vestiges of scales except upon the head. External limbs are absent (except in one genus), and only vestiges remain of any limb-bones. Their tails are so short and blunt that they are popularly said in some countries to have two heads, whence the scientific name of the group. There is also a legend that when cut in two, the two ends will find one another and reunite. This notion is strengthened by their ability to move either forward or backward with equal ease. About a dozen genera and more than 60 species are known, most of which inhabit the warmer parts of America and Africa; some also live in Asia Minor and in Spain. They are frequently found in ants' nests, and have been called «mothers of ants» in consequence. Their eyes and ears are concealed beneath the skin. A common species in South America and the West Indies (*Amphisbæna fuliginosa*) is checkered black and white, and is from one to two feet in length. Like the others it feeds upon worms and small insects found under the surface of the ground. They are quite harmless.

AMPHITEATROV, Alexander Valentinovitch, vä-lẹn-tē-nō'vich äm-fē-tä-ä'trof, a popular Russian writer of the naturalistic school. He was born at Kaluga (central Russia) of ecclesiastical parentage in 1862, and studied music and jurisprudence, the latter at the Moscow University. His literary career began in 1887, when his light verse and prose commenced to appear in various humorous periodicals. As special correspondent of the foremost Russian daily, *Novoye Vremia,* he at one time attracted considerable attention under the pseudonym of «The Old Gentleman.» In 1902 he was exiled to Siberia for certain advanced views expressed in his own periodical, *Russia.* Since 1905 he has been living abroad, where he edited a progressive periodical called *The Red Banner.* Among his extra-literary achievements perhaps the most important was the founding at Paris of The Russian School of Social Science, at which he delivered courses of lectures.

Amphiteatrov has been an extremely prolific writer, whose literary output, if collected, might easily fill half-a-hundred volumes. His works already published include numerous novels, dramas, critical and biographical essays, studies in history and an endless variety of humor. As none of these are available in English, it would be superfluous to enumerate them in a general reference work intended for English readers. A few characteristic titles of his more important novels are 'The Blood of Alimov' (1884), a decidedly zolaesque work with which the author first attracted general attention; 'Fiedka the Murderer' (1892), a study in hereditary predisposition; 'Victoria Pavlovna' (1907), a most interesting work dealing favorably with the woman question; 'The Dusk of the Demigods' (1908), a two-volume work depicting the vanities and tribulations of actors, playwrights and singers, and 'The Men of the Eighties and Nineties' (1907–10), also in two volumes, constituting the initial works of a projected series which was intended to picture, in leisurely Balzac fashion, Russian society from 1880–1910. His non-fiction includes 'A Literary Album,' a volume entitled 'Humor,' and a very creditable study of anti-semitism. His dramas are commonly adaptations from his novels — and sometimes the author reverses this process of literary manufacture.

Amphiteatrov is not in any sense a great Russian writer — not even when judged by contemporary Russian standards. He lacks the originality of Gorky, the inventiveness of Andreyev and the art of Artsybashev (qq.v.). Although he, too, is a realist, his realism is rather of the simple physiological kind of Zola than of the great Russian variety developed by Gogol, Tolstoy and Dostoyevsky (qq.v.). His special interests in human nature lie with the play of temperaments and hereditary predispositions, both well illustrated in 'The Dusk of the Demigods,' teeming with alcoholics, and in 'The Men of the Eighties,' full of degeneracy. This interest in the abnormal and subnormal human types, which is suggestive of Dostoyevsky and which links Amphiteatrov somewhat with Andreyev, makes most of his

novels and dramas really studies in social pathology, which naturally renders their vogue ephemeral. Indeed, it is not as a writer of novels and plays that Amphiteatrov has won his real fame; his special field is literary journalism and humorous improvisation, as he has himself avowed, and in this field he ranks easily among Russia's greatest writers.

DAVID A. MODELL.

AMPHITHEATRE, with the Romans, a building without a roof, of a round or oval form, destined for the combats of gladiators or of wild beasts. In the middle was the arena, a large place covered with sand, on which the fights were exhibited. Round about were the vaults or caves in which the animals were kept; above these was the gallery, from which ascended successive rows of seats, each of greater height and circumference than the preceding. The first 14 were for the senators and judges, the others for the common people. Julius Cæsar erected the first large amphitheatre at Rome for his gladiatorial exhibitions. It was of wood. Statilius Taurus, 20 years later, built the first stone one. The Coliseum at Rome is the largest of all the ancient amphitheatres. (See COLISEUM). In Verona there is one the interior of which still shows the whole ancient architecture and is carefully preserved. See HIPPODROME.

AMPHITRITE, in Greek mythology, a daughter of Oceanus and Tethys, or of Nereus and Doris. Poseidon wished to make her his wife, and as she hid herself from him he sent a dolphin to find her, which brought her to him, and received as a reward a place among the stars. As a goddess and queen of the sea she is represented as drawn in a chariot of shells by tritons, or riding on a dolphin, before which a cupid swims, with the trident of Poseidon in her hand.

AMPHIT'RYON, in Greek mythology, King of Thebes, son of Alcæus, and husband of Alcmena. Plautus, and after him Molière, have made the trick played upon him by Zeus (in assuming his form in order to enjoy the embraces of his wife) the subject of amusing comedies, in which the return of the true Amphitryon, and his meeting with the false one, occasion several humorous scenes.

AMPHIUMA, a genus of Amphibians that lose their tadpole gills, but retain a gill slit. See KONGO SNAKE.

AMPHIUMIDÆ, ăm-fē-yū'mĭ-dē, a family of urodele *Amphibia* (q.v.). There are no gills in the adult, but a single pore-like branchial fissure may persist on each side. Respiration is pulmonary, but the inspirations occur only at intervals of several minutes. The vertebræ are biconcave but, like the remainder of the skeleton except the cartilaginous carpi and tarsi, are well ossified. There is no ethmoid bone, and the internal ear is separated from the brain by membrane only. A maxillary bone is developed, and teeth are borne on the margins of both jaws, as well as on the vomers, but not on the parasphenoid. The eyes are very small and devoid of lids; two pairs of limbs are always present, and the tail is permanently provided with a fin. Two genera are known: *Cryptobranchus,* which contains the American hellbenders, and the giant salamander of eastern Asia, and *Amphibia,* with very much reduced limbs and persistent gill-clefts, found in the Southeastern States.

AMPHORA, a vessel used by the Greeks and Romans for holding various liquids, particularly wine. They were of various forms, but most commonly tall and narrow, with a pointed end which fitted into a hole or socket to enable them to stand upright. Properly an amphora was a two-handled vessel, from Greek *amphi,* both, and *phero,* to carry.

AMPHOTERIC, a chemical property of many organic substances, urine, milk, blood, etc., to show acid to blue litmus and alkaline to red litmus, thus paradoxically being both acid and alkaline.

AMPLITUDE, in astronomy, the distance of any celestial body or other object (when referred by a secondary circle to the horizon) from the east or west points; the complement to the amplitude, or the distance from the north or south point, is called the azimuth.

AMPTHILL, ămt'hĭll, Odo William Leopold Russell, 1ST BARON, British diplomat and ambassador: b. Florence, 20 Feb. 1829; d. Potsdam, Germany, 25 Aug. 1884. He was educated at home, and became attaché at Vienna, and later at Florence. In 1858 he removed to Rome where he remained 12 years as the real though unofficial representative of England at the Vatican. In 1871 he became ambassador at Berlin, where he rendered great service at the congress. He kept on the best of terms with Bismarck, carefully avoiding everything that could give any cause of offense to that most jealous minister, whom he, however, did not hesitate to withstand when his unscrupulousness went the length of deliberately attempting to deceive.

AMPUDIA, ăm'poo-dyą, Pedro de, Mexican soldier. He first appears in the wars against Texas, Santa Anna (q.v.) making him a general in 1840. He engaged in forays and fights here for some years, coming into conflict with Summerville's Texas troops and commanding the land forces in the siege of Campeachy; compelled to retreat 26 June 1843, he went to Tabasco, and in 1844 captured and summarily executed Sentmanat who had assaulted it. The act was loudly condemned and he was dismissed. He reappeared in the United States-Mexican War under Arista; was in the fight at Matamoras, 11 April 1846; was given command of Monterey, but surrendered to Taylor 24 September and vanishes from history.

AMPULLA (Lat.), in antiquity, a vessel bellying out like a jug, that contained unguents for the bath; also a vessel for drinking at table. The ampulla has also been employed for ceremonial purposes, such as holding the oil or chrism used in various church rites and for anointing monarchs at their coronation.

AMPULLARIA. See APPLE-SHELL.

AMPUTATION. See SURGERY.

AMRAM, ăm'răm, Jewish educator: d. 875. A famous "gaon" or head of the Jewish Academy of Sura (Persia) in the 9th century. He was the author of many 'Responsa,' but his chief work was liturgical. He was the first to arrange a complete liturgy for the synagogue, and his prayer-book ('Siddur Rab 'Amram')

was the foundation of most of the extant rites in use among the Jews. The 'Siddur' was published in Warsaw in two parts (1865).

AMRAOTI, ŭm-ryŏt'ĭ, India, a town and district in Berar, central provinces. The district was reconstituted in 1905, when that of Ellichpur was incorporated with it. It is the richest town of Berar, with the most numerous and substantial commercial population. It possesses a branch of the Bank of Bombay and has the largest cotton mart, where an average of 80,593 bojas of cotton are bought and sold annually. It has also a large grain market, cotton presses, ginning factories and oil mills. The population of the town is about 35,000. The district of Amraoti has an area of 4,754 square miles. It is an extensive plain, about 800 feet above sea-level, the general flatness being only broken by a small chain of hills, running in a northwesterly direction between Amraoti and Chandor. The principal towns, besides Amraoti, are Karinja, Kolapur and Badnera, which lie on the Great Indian Peninsula Railway, the main line of which crosses the district. Pop. about 810,000.

AMRAPHEL, King of Shinar (=Sumer, the Sumerian or south Babylonian plain), a monarch mentioned in Gen. xiv as an ally of Chedorlaomer, King of Elam, in subduing his revolted Palestinian vassals. Two other allied kings are named: Arioch of Ellasar (Larsa, South Babylonia) and Tidal of Goiim (translated «nations» in Authorized Version; identified by some with Gutium in Media, by others with «the tribes»=the wandering Kurds). Neither of the names nor any mention of the raid is found on the inscriptions; and the expedition, with its capture of Lot and the successful recapture by Abraham, has no critical standing. Nevertheless it is most interesting historically; for the non-Jewish names are apparently genuine, and the conditions are precisely those of the times which the names would imply. Arioch would correspond to the Babylonian Eriaku, supposed to be found in a fragmentary epic on the invasion of Babylonia; Tid 'al to a Tudhkula or Tudhghula also said to be recognizable there; and Chedorlaomer to Kudur-Laghamar, the first half of which is found in other Elamite royal names, as Kudur-Mabuk, etc., and the last is probable. As to Amraphel, he is very plausibly Hammurabi (q.v.), the great revivor of the Babylonian monarchy about 2250, after its conquest by the Elamites; or rather Hammurabi-ilu (the divine name el or ilu added, as common in Babylonian and Egyptian; cf. Joseph-el and Jacob-el against the Hebrew Joseph and Jacob), or perhaps Hammu-rapaltu, a probably dialectic variant of Kimta-rapashtu actually found written. Chedorlaomer's expedition is like other known ones of Babylonian kings against the lands west of the Mediterranean, which they claimed as tributary. But there is a closer verisimilitude, which makes it practically certain that the substance of the story was taken from a Babylonian tablet describing an actual occurrence; Amraphel in the story is a subordinate ally of Chedorlaomer and the historical Hammurabi was apparently a dependent sub-king of Babylon under the Elamites before he threw off their yoke. The added Abraham story may represent a tradition welded with the other in later times.

AMR IBN AL-ASI, umr-ibĕn-ăl-azi, Arabian general: d. 6 Jan. 664. He was a violent opponent of Mohammed until his conversion to Islam in 629 A.D. Abu Bekr entrusted him with a high command in the army destined for the conquest of Syria, and to Amr is chiefly due the success of the expedition. In 639 he led an army into Egypt for the purpose of subjugating that country. After a long siege he reduced Alexandria and signed a treaty of peace 8 Nov. 641. Amr supported Moawiya against Ali in the contest for the caliphate and was thus instrumental in establishing the Omayyad dynasty. In 658 he reconquered Egypt and governed it till his death. His administration was beneficent and its moderation facilitated the spread of Islam in that country. He reopened a canal 80 miles long from the Nile to the Red Sea with the object of renewing communication between the latter and the Mediterranean. To Amr has been attributed the burning of the famous library of Alexandria. But this crime was quite inconsistent with his character and the story may well be regarded as untrue, as it was not advanced until six centuries after Amr's death by Abulfaragius. Consult Butler, 'Arab Conquest of Egypt' (Oxford 1902); de Goeje, M. J., 'Mémoire sur la conquête de la Syrie' (Leiden 1900); Gibbon, E., 'Decline and Fall of the Roman Empire'; Muir, Sir W., 'The Caliphate' (London 1891).

AMRITSIR, ŭm-rĭt'sär, or **UMRITSIR** (that is, «the pool of immortality»), a town of Hindustan, capital of a district of the same name, in the Punjab, the principal place of the religious worship of the Sikhs. It is, on account of its favorable situation between Cabul and Delhi, Cashmere and the Deccan, a place of great trade, and has considerable manufactures of shawls and silks; but its chief attraction to the natives is the sacred pond constructed by Ram Das (one of the earlier pontiffs of the Sikh faith), in which the Sikhs immerse themselves that they may be purified from all sin. This holy basin is 150 paces square, built of brick, having in its centre the chief temple of the Sikh religion. Under a silken canopy in this temple is deposited the book of Sikh religion and laws, called the Granth. The voluntary contributions of pilgrims and devotees support this place, to which 600 priests are attached. Pop. about 164,000 (including cantonments). The district of Amritsir lies between the rivers Ravi and Bias. It is intersected by numerous canals. Its area is 1,601 miles. Pop. about 2,500,000.

AMROHA, India, a town in the Moradabad district of the United Provinces. It contains the tomb of a Mohammedan saint, Shaikh Saddu, and has been for many centuries a Mohammedan centre. Pop. about 40,000.

AMRU, originally an opponent and subsequently a zealous supporter of Mohammed, and one of the ablest of the Mohammedan warriors. He brought Egypt under the power of the Caliph Omar in 638, and governed it wisely till his death in 663. The burning of the famous Alexandrian Library has been generally attributed to him, though only on the authority of a writer who lived six centuries later.

AMSDORF, ăms'dôrf, **Nicolaus,** a Protestant reformer of the 16th century: b. in

Gross-Zschopa, near Wurzen, on the Mulde, 3 Dec. 1483; d. 14 May 1565. He was educated at Leipzig, and then at Wittenberg, where he was one of the first who matriculated (1502) in the recently-founded university. He obtained various academical honors, and became professor of theology in 1511. He joined Luther at the very beginning of his struggle (1517); continued all along one of his most determined supporters; was with him at the Leipzig Conference and the Diet of Worms, and was in the secret of his Wartburg seclusion. He assisted the first efforts of the Reformation at Magdeburg, at Goslar, and at Einbeck, took an active part in the debates at Schmalkald, where he defended the use of the sacrament by the unbelieving, and spoke out strongly against the bigamy of the Elector of Hesse. He urged the separation of the High Lutheran party from Melancthon, got the Saxon dukes to oppose the Frankfurt Recess (1558), and continued to fight for the purity of Lutheran doctrine until his death.

AMSLER, Samuel, one of the most distinguished of engravers: b. in Schinznach, in the canton of Aargau, 1791; d. 18 May 1849. Amsler's principal engravings are 'The Triumphal March of Alexander the Great' and a full-length 'Christ,' after the sculptures of Thorwaldsen and Dannecker; the 'Burial of Christ,' and two 'Madonnas,' after the pictures of Raphael; and the 'Triumph of Religion in the Arts,' after Overbeck, his last work, on which he spent six years.

AMSTERDAM, formerly called **AMSTELREDAM,** the chief city of the Netherlands, is situated in the province of North Holland, at the influx of the Amstel to the Ij or Y (pronounced eye), an arm of the Zuyder Zee. The city is built in the shape of a semicircle, and within this semi-circle four canals — the Prinsen Gracht, Keizer's Gracht, Heeren Gracht and the Singel Gracht — extend in the form of polygonal crescents, nearly parallel to each other, while numerous smaller canals intersect the city in every direction, dividing it into about 90 islands, with about 300 bridges. The site of Amsterdam was originally a peat bog, and all its buildings rest upon piles that are driven from 14 to 60 feet through a mass of loose sand and mud until they reach a solid stratum of firm clay. This foundation is perfectly secure as long as the piles remain under water. At the beginning of the 13th century it was merely a fishing village, with a small castle, the residence of the lords of Amstel. In 1240 Giesebrecht III of Amstel built a dam to keep out the sea but, in 1296, on account of the share of Giesebrecht IV in the murder of Count Floris of Holland, the rising town passed out of the hands of the counts of Amstel and shortly thereafter, with Amstelland (the district on the banks of the Amstel), it was taken under the protection of the counts of Holland, and from them received several privileges which contributed to its subsequent prosperity. In 1482 it was walled and fortified. After the revolt of the seven provinces (1566) it speedily rose to be their first commercial city and a great asylum for the Flemish Protestants; and in 1585 it was considerably enlarged by the building of the new town on the west. The establishment of the Dutch East India Company (1602) did much to forward the well-being of Amsterdam, which, 20 years later, had 100,000 inhabitants. In the middle of that century the war with England so far reduced the commerce of the port that, in 1653, 4,000 houses stood uninhabited. Amsterdam had to surrender to the Prussians in 1787, to the French in 1795, and the union of Holland with France in 1810 entirely destroyed its foreign trade, while the excise and other new regulations impoverished its inland resources. The old firms, however, lived through the time of difficulty, and in 1815 commerce again began to expand — an expansion greatly promoted by the reconstruction of the harbor, the opening in 1876 of a new and more direct waterway between the North Sea and the city, and by the building of the Merwede Canal in 1892, which places Amsterdam in direct connection with the Rhine.

The city has a fine appearance when seen from the harbor or from the high bridge over the Amstel. Church towers and spires, and a perfect forest of masts, relieve the flatness of the prospect. The old ramparts have been leveled, planted with trees and formed into promenades. Between 1866 and 1876 many spacious streets and an extensive park were added to the city. Tramways have been successfully introduced and the harbor greatly improved. There are suburban steam and electric tramways and railway communication with all parts of the country and of Europe. An extensive system of canals and sluices and rich grassy meadows surround the city. On the west are a great number of windmills for grinding corn and sawing wood. On each side of the three chief canals, with a row of trees and a carriageway intervening, are handsome residences. The building material is brick, and the houses have their gables toward the streets, which gives them a picturesque appearance. Amsterdam is the centre of the national system of defense. There is a fort at the entrance of the harbor and sluices several miles from the city which can flood in a few hours the surrounding land. The population, which from 217,024 in 1794 sank to 108,179 in 1815, rose steadily to 565,589 in 1908, of whom the majority belonged to the Dutch Reformed Church. Of the remainder, about 95,000 were Catholics, 60,000 Jews from east Europe and 5,000 Portuguese Jews. The chief industrial establishments are sugar, camphor and borax refineries, engineering works, mills for polishing diamonds and other precious stones, ship-building yards, manufactories of sails, ropes, tobacco, silks, gold and silver plate and jewelry, dyes, chemicals, candles, cobalt blue and machinery, rice mills, glass blowing establishments, lumber mills, breweries, distilleries, with export houses for corn and colonial produce, Amsterdam being the chief market for the Dutch East Indian trade. There is a vast system of docks, quays and storehouses, and the headquarters of the large shipping companies are here; 2,152 vessels (tonnage 2,310,000) entered the port in 1913 and 1,707 (tonnage 1,844,000) cleared. It is also the financial centre of Holland. The present Bank of the Netherlands dates from 1814, Amsterdam's famous bank of 1609 having been dissolved in 1796.

The great focus of life is the Dam. Here stands the former Stadthuis ("townhouse"),

converted in 1808 into a palace for King Louis Bonaparte, and still retained by the reigning family. Built by Van Kempen in 1648–55, and raised upon 13,659 piles, it extends 262 feet in length by 207 feet in breadth, and is surmounted by a round tower rising 182 feet from the base. It is adorned on the exterior and in the interior with sculptures by Artus Quellinus, and has a hall 120 feet long, 57 wide and 90 high, lined with white Italian marble — an apartment of great splendor. The cruciform *Nieuwe Kerk* (New Church), a Gothic edifice of 1408, is the finest ecclesiastical structure in the city, with a splendidly carved pulpit, and the tombs of Admiral de Ruyter, the great Dutch poet Vondel and various other worthies. The Old Church (*Oude Kerk*), built in the 14th century, is rich in painted glass, has a grand organ and contains several monuments of naval heroes. Literature and science are represented by a university supported by the municipality (till 1876 known as the *Athenæum Illustre*), with a library of 148,000 volumes, including the Rosenthal collection of over 8,000 books on Jewish literature; by academies of arts and sciences, by museums and picture galleries, a palace of national industry, one of the finest botanical gardens in Europe, six theatres, etc. The new Rijksmuseum contains a truly national collection of paintings, its choicest treasure being Rembrandt's 'Night-guard.' The Six Gallery contains a small but priceless collection of Dutch masters. Modern art is represented in the Municipal and Fodor museums. Rembrandt (q.v.) made Amsterdam his home, and his statue (1852) now fronts the house he occupied. Spinoza was a native. There are many hospitals and benevolent institutions, well supported and managed on good principles, including the celebrated Society for Public Welfare, with branches over all Holland, and various orphan asylums. A water supply was introduced in 1853. The exports from the Amsterdam district to the United States attained the value of $30,183,706 in the first nine months of 1916, which is larger than the total for any corresponding period. The increase was due chiefly to the transfer to Amsterdam of the business done at Antwerp before the war. Area 18⅛ square miles. Pop. (1909) 566,131; (1913) est. 595,258.

AMSTERDAM, N. Y., city of Montgomery County, 33 miles northwest of Albany. It is located on the Mohawk River, the Erie Canal and the West Shore Railway and is a busy manufacturing centre and Barge Canal shipping terminal. Amsterdam has numerous industries, producing such diversified objects as carpets, knit-goods, rugs, wagon-springs, paper, silk, paper-boxes, brooms and gloves. The United States census of 1914 reports 117 manufacturing establishments of factory grade, employing 11,379 persons, of whom 10,774 are wage earners, receiving $4,998,000 annually in wages. The capital employed is $22,645,000, and the value of the product is $22,475,000; of this, $9,310,000 was added by manufacture. There are also foundries and machine-shops; three daily newspapers are published. Here are located an academy, a hospital, a board of trade and chamber of commerce, numerous churches and a Roman Catholic institute. There are well-paved streets, a fine system of drainage, an excellent water supply, an electric lighting system and free garbage disposal plant and collection service. Amsterdam was first settled about 1778, and until 1804 it was known as Veedersburg. It was incorporated as a village in 1830, and as a city in 1885. Pop. (1910) 31,267; (1915) 35,119.

AMSTERDAM, Bank of. This institution was established in 1609, much upon the plan of the Bank of Venice. Its chief and at first its only function was that of affording payment for bills of exchange drawn upon the merchants of that great commercial port, in full-weighted coins; the coins in common circulation being more or less below standard by reason of attrition, filing, sweating or other means of degradation. In order to give effect to the plan of the bank, the municipal law provided that all bills of exchange above 600 guilders should be payable only at the bank. Its capital consisted entirely of its customers' deposits, whose desire to meet their bills promptly induced them to keep a sufficient balance at the bank for that purpose. The city guaranteed the solvency of the bank; and to guard against mismanagement appointed its principal officers and made frequent examinations of its accounts. For this guarantee the bank charged the depositor and paid the city 10 guilders for each account opened, besides other small fees on transfers, amounting in the agregate to between 150,000 and 200,000 guilders per annum. "Bank money" usually commanded a premium or agio of 5 to 9 per cent in circulating money, the agio representing the difference between newly minted coins and those in circulation. It was the common belief that for every guilder represented by the bank's receipts or acknowledgments for deposits there was a metallic guilder in the vaults of the bank, so that it appears to have made no loans and indulged in no enterprises or speculations. In 1672 when the French King Louis XIV was at Utrecht, the bank paid in coins, which, by the marks of fire upon them, must have lain in its vaults more than half a century. However, upon the second French invasion, 1793, the bank was found to be entirely destitute of money, the deposits having been drawn down and concealed for greater safety. After a useful career of more than two centuries the bank was wound up in 1820. For the history of other ancient banks see list under the heading BANKS, ANCIENT AND MODERN.

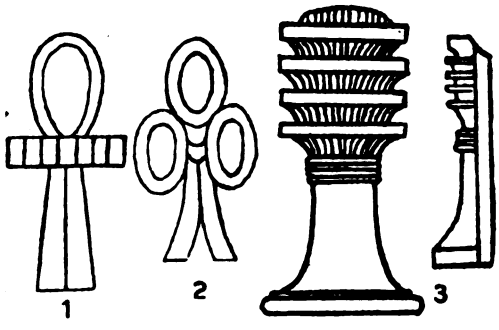
AMSTERDAM, an uninhabited and almost inaccessible island in the Indian Ocean, in lat. 37° 47′ S. and long. 77° 34′ E., about 60 miles north of Saint Paul Island, and nearly midway between the Cape of Good Hope and Tasmania. It is an extinct volcano, rising 2,989 feet from the sea. It was discovered by Anthony Van Diemen in 1633 and annexed by France in 1893. In 1871 the British frigate Megaera was wrecked here, and most of the 400 persons on board had to remain upwards of three months on the island. The 'Mémoires' of a Frenchman, Capt. François Péron, who was marooned three years on the island (1792–95), are of much interest.

AMU, a-moo′, or **AMOO DARYA** (Arab. *Gihon*), river of central Asia, the ancient Oxus. It takes its rise in the eastern Pamir near the boundary of eastern Turkestan, flows at first

generally west (to long. 66° E.), thence generally northwest, and empties by a delta into the southern part of the Aral Sea. It receives several affluents from the mountains of Turkestan and the Hindoo Koosh. About 1,600 miles in length, it is navigable by light draught vessels for about 800. As a means of irrigation, it is of considerable importance. See OXUS.

AMULETS. In general an amulet may be described as a charm made of stone, metal, earthenware, parchment, paper or other material, having incised or inscribed magic figures, characters or a bare inscription on it. The amulet is used to protect the wearer against witchcraft, sickness, etc. It has been usually worn suspended from the neck. The words «amulet» and «talisman» are commonly considered as synonymous. But, while the amulet is supposed to be limited to protecting the bearer from all malignant outside influences, the talisman is supposed to have, besides this power of protection from danger to its wearer, also miraculous influences on others. The talisman is supposed to be able to enforce, for its possessor, the love and influence of others.

Much study and discussion have been devoted to the derivation of the word amulet. The opinion that it was from the Arabic hamâil

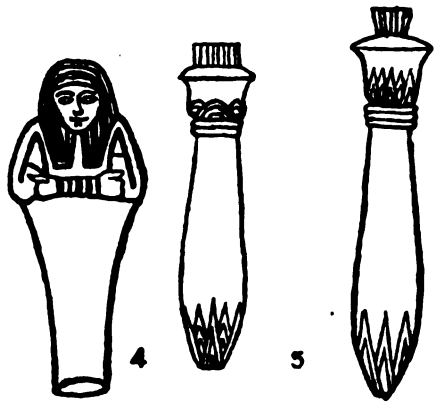


1. ANKH. Called "girdle of Isis." Symbol of Life.
2. THET, Symbol of blood of Isis. Cleansed wearer from sins.
3. DAD or DED (front and side views). Backbone or Osiris. Cared for the wearer in the underworld.

(necklace, sword-belt), or hamalet (something suspended), is wavering. Pliny said the country folk called the cyclamen which they planted in the house to make all poisonous drugs harmless, amuletum. This derivation receives more general acceptance.

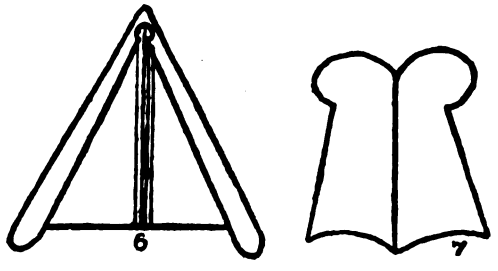
Faith in the power of amulets has existed in every nation from time immemorial. Among the ancients the most prominent Orientals to attain a fixed amulet cult were the Chaldeans, Babylonians, Persians, Indians, Chinese and Japanese. But foremost in the popular cultivation of the faith in amulets must be placed the ancient Egyptians. Among the ancient Nile-dwellers the oldest and far most prolifically used form of amulet was the scarab (q.v.). Many thousands are to be found in the museums and other collections. These, with a multitude of peculiar amulets, are found on the mummy bodies in every Egyptian tomb, each for its specific future purpose, buried to keep the deceased free from the numerous torments of the underworld.

Among the ancients we find the Greeks favored as amulets rings of iron. Roman amulets consisted largely of necklaces, bracelets, metal diadems, precious stones, and, especially, black coral (*gorgonia antipathes*). They often enclosed their amulets in lense-shaped receptacles (*bullæ*), and attached them to the necks of their boy children. Roman lawyers wore a baby's caul as bringing prosperity. The Germanic peoples used the symbol of Thor's hammer, luck-stones, herbs, pieces of certain roots, also the prehistoric flint arrowheads mounted in gold, etc. The Jews bound thongs, containing verses of the Law, round the head or arm (*phylacteries*) for protection from evil; the figures of gods or stars, magic rings, etc., were illicitly worn.



4. USHABTI AMULET. Acted as servant in the underworld.
5. UAT. Papyrus columm amulets. Rendered the wearer immortal and immune from injury.

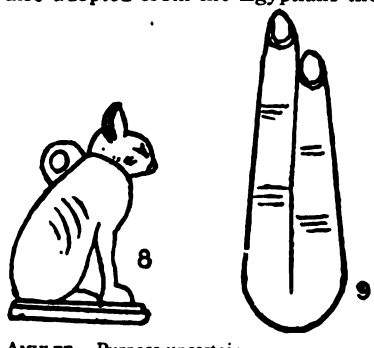
In the Middle Ages, when such amulets were placed under the ban of the Christian churches of Constantinople (Byzantium) and Rome, the Agnus Dei and Holy Virgin medallions took their place, or pieces of parchment were carried inscribed with the beginning of the Gospel of St. John. The Agnostic stones carried (in rings or in the clothes) by the Hermetics were strictly amulets. The early Christian, pierced ivory, glass, and bronze fishes were, undoubtedly, amulets. The encolpia of the 4th



6. MASONS' PLUMB LINE. Purpose uncertain.
7. "AMMON'S FEATHERS" AMULET. Symbol of Truth and Righteousness — attributes of a good ruler.

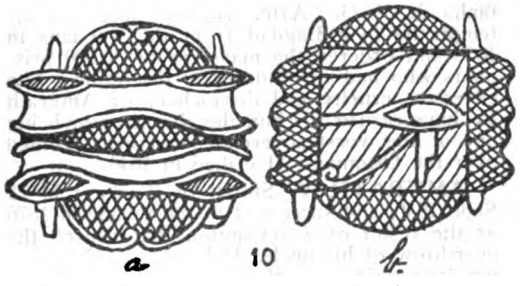
century also belongs to the same category. Rings mounting a «toadstone» were worn by women to keep bad fairies from their newborn babes.

In the present day Mohammedans carry as amulets faith-stones, rings, pieces of paper inscribed with magic formulæ or with the "99 Attributes of Allah," or verses of the Koran. They also adopted from the Egyptians the hand



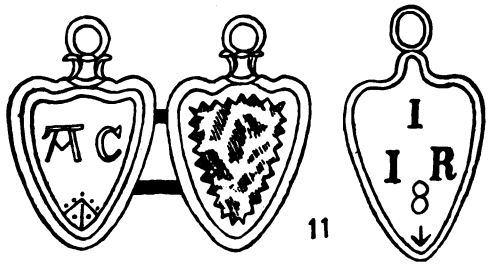
8. CAT AMULET. Purpose uncertain.
9. "TWO FINGER" AMULET. Relaxed the mouth muscles in the underworld when wearer was hungry.

amulet ("hand of Fatima"), to suspend in their dwellings or wear, to ward off the "Evil Eye"; all in spite of the laws of the Koran. Italians attach small images or pieces of coral to their children's necks "against the Evil Eye." They even suspend amulets to their domestic animals



10. OUZA. "Divine Eye" amulets. (a) Double ouza amulet. (b) Single "divine eye." Protected the wearer from the "evil eye."

for this purpose. In southern Europe we find coral used also as protection from hemorrhages, pieces of elkhorn as cure for epilepsy, not to mention abracadabra tablets and amulet coins. In England the widest known amulet at this day is, probably, the baby's caul, for which



11. SCOTCH "ELF-ARROWS." Prehistoric flint arrowheads mounted for wear as "lucky" amulets.

sailors, especially, pay a good price, as it is said to be a sure protection against drowning. The Scotch, to this day, wear as amulets prehistoric flint arrowheads mounted in silver; they call them "elf-arrows" and suppose them to have been shot from the heavens by the fairies. These are used by the Italians also who know them as "tongues of Saint Paul."

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CLEMENT W. COUMBE.

AMUNDSEN, ä'mŭn-sĕn, **Roald,** Norwegian explorer: b. Borge, Smaalenene, Norway, 16 July 1872. He studied medicine for two years at the University of Christiania, then entered the Norwegian naval service, went to sea in 1893, and in 1897 became first officer on the Belgica, of the Belgian South Polar Expedition (1897–99). In 1901 he made oceanographic researches off the northeast coast of Greenland with the Gjöa, a small vessel registering 47 tons, and after studying terrestrial magnetism at Wilhelmshafen, Hamburg and Potsdam set sail in June 1903 in the Gjöa to relocate the position of the Magnetic North Pole. Taking up his headquarters on the southeast side of King William's Land he made during 19 months a magnetic survey of a considerable region around the pole and was thus able to prove that it has probably no stationary position but is in continual movement. His observations were taken to Norway where their reduction is still in progress. During this expedition Amundsen was also the first and only man to accomplish the long-attempted feat of taking a ship from the Atlantic to the Pacific through the North West Passage. He reached Herschel Island on 13 Aug. 1905, having accomplished one of the most important tasks ever performed in geographic exploration. In 1909 Amundsen planned an expedition in Nansen's ship, The Fram, with the object of drifting across the North Polar Sea, but sufficient funds for this purpose were still lacking when he learned of Peary's discovery of the North Pole. Fearing that the incentive for further contributions had been removed, he secretly resolved to make his objective point the South Pole, believing that he had sufficient equipment for an Antarctic expedition. He started on 9 Aug. 1910, first announced his change of plan to the world from Madeira, and on 14 Jan. 1911, arrived in the Bay of Whales, which he made his base, and pitched his winter camp on the Great Ice Barrier. In October 1911 he started with four companions his dash for the pole, which he reached on 16 Dec. 1911, a month before his English competitor, Captain Scott. Amundsen owed his success not only to his superb courage and endurance, and to favorable weather conditions,

but also to his attention to the smallest details of his equipment, and to his use and knowledge of dogs as draught animals. After his return he lectured in most cities of Europe, North America and Australia; and his book, 'The South Pole,' was translated into many languages and published in English in 1912. His long-delayed drift across the Arctic Ocean, on which he had planned to start in 1914, was indefinitely postponed on the outbreak of the European War, as Amundsen felt the Norwegian government might have other uses for their $40,000 appropriated for the purpose. Amundsen also wrote 'The North West Passage,' published in English in 1908.

AMUR, am-ör', river formed by the junction (about lat. 53° N. and long. 121° E.) of the Shilka and the Argun, which both come from the southwest. From the junction the river flows first southeast and then northeast, and, after a total course of 3,060 miles, falls into the Sea of Okhotsk opposite the island of Sakhalin. It is very valuable for navigation, and carries a considerable fleet of steamers, but on account of the bar at its mouth goods are generally disembarked and carried overland to Alexandrovsk. In 1636 Russian adventurers made excursions to the lower Amur, and in 1666 built stations and a fort at Albazin. In 1685 both stations and the fort were taken by the Chinese, but were promptly retaken by the Russians, who in 1689 abandoned the whole territory of the Amur to the Chinese. In 1854–56 two military expeditions were conducted by Count Muravieff, who established the stations of Alexandrovsk and Nikolaevsk. In 1858 China agreed to the Treaty of Tien-tsin, by which the boundaries of Russia and China were defined. The left bank of the Amur and all the territory north of it became Russian; and below the confluence of the Ussuri both banks. In 1860, after the occupation of Pekin by the British and French, General Ignatieff secured the signature of Prince Kung to a treaty by which Russia acquired the broad and wide territory comprised between the river Amur and the mouth of the Tumên, extending 10° of latitude nearer the temperate regions, and running from the shore of the north Pacific eastward to the banks of the river Ussuri, a principal affluent of the Amur. In September 1900 Russia took formal possession of the right bank of the river. This vast territory falls into two Russian provinces — the Maritime Province between the Ussuri and the sea, and the government of Amur north of the river. The latter has an area of 175,000 square miles. The country is richly timbered, and is admirably adapted for pasturage and agriculture, though the climate is severe. Fur-bearing animals are still plentiful and the river abounds in fish. The capital is Khabarovka. Nikolaevsk, once the only important place in these regions, is on the Amur, 26 miles from its mouth, where the river is 1¼ miles wide, and in places 15 feet deep; but the political centre tends southward to the more temperate Maritime Province (area, 730,000 square miles), near the southern end of which is situated the important harbor of Vladivostok ("Rule of the East"), or Port May, which in 1872 was placed in telegraphic communication with Europe by the China submarine cable, and is now the capital of the Amur provinces. The island of Sakhalin (Saghalien), north of the Japan group, along a portion of the coast of Asiatic Russia, and formerly possessed partly by Russia and partly by Japan, is also a part of the Amur region in the wider sense.

AMURATH I, ä'mōō-rät, a sultan of the Turks; succeeded his father, Orchan, in 1360. He founded the corps of Janissaries, conquered Phrygia and on the plains of Cassova defeated the Christians. In this battle he was wounded, and died the next day, 1389.

AMURATH II, one of the more illustrious of the Ottoman emperors, succeeded his father, Mohammed I, in 1421, at the age of 17. In 1423 he took Thessalonica from the Venetians; in 1435 subdued the despot of Servia, besieged Belgrade, which was successfully defended by John Hunniades; defeated the Hungarians at Varna in 1444, and slew their king, Ladislaus. He died in 1451.

AMURATH III, succeeded his father, Selim II, in 1574. His first act was the murder of his five brothers. He added several of the best provinces of Persia to the Turkish empire. He was noted for his avarice, and his sensual excesses made him prematurely old. He died in 1595.

AMURATH IV, succeeded his uncle, Mustapha X, 1623. After two unsuccessful attempts he took Bagdad from the Persians in 1638 and ordered the massacre of 30,000 prisoners who had surrendered at discretion. The excessive cruelty and debauchery of Amurath IV have earned for him the character of being one of the worst sovereigns that ever reigned over the Ottomans. He died in 1640.

AMURATH V, Sultan of Turkey: b. 21 Sept. 1840, and succeeded to the throne in 1876 as the result of a revolution that caused the overthrow of his uncle, Abdul Aziz. His reign was for a few months only, as he developed strong symptoms of insanity and was deposed in August 1876.

AMUSSAT, Jean Zuléma, a-müssą zhôn zülęma, French surgeon: b. 1796; d. 1856. He entered the army in early life, was later assistant surgeon at the Salpêtrière Hospital and a member of the Paris faculty of medicine. He was the inventor of many surgical appliances and first adopted the method of torsion of the arteries in hæmorrhage. He was the first to perform the operation for opening the large intestine at a point where it is not covered with peritoneum. It is still practised and is known by his name. He wrote on the nervous system and on the torsion of arteries.

AMY'CLÆ. (1) An ancient town of Laconia, on the eastern bank of the Eurotas, 2½ miles southeast of Sparta. It was the home of Castor and Pollux, the "Amyclæan brothers." It was conquered by the Spartans only before the First Messenian War. (2) An ancient town of Latium, which claimed to have been built by a colony from the Greek Amyclæ.

AMYGDALIN, a-mig'da-lin (from the Latin *amygdald,* "almond"), a crystalline substance occurring in bitter almonds, in the kernels of apples, pears and peaches, in the leaves of the laurel (*Cerasus lauro-cerasus*) and in the leaves and bark of various species of the

genus *Prunus*. It has the formula $C_{20}H_{27}NO_{11}+3H_2O$, and is of special interest to the chemist because it was the first known of the numerous class of substances termed "glucosides" (q.v.). It is obtained by extraction, with boiling alcohol, of the pulp left after the expression of the oil from bitter almonds. The alcoholic solution is concentrated by evaporation and the amygdalin precipitated by the addition of ether, in which it is insoluble. Like the other glucosides, amygdalin does not form salts with acids, but is decomposed by them with the formation of glucose. Amygdalin, while of a bitter taste, is not poisonous. When dissolved in water it undergoes no change but if some dilute mineral acid such as emulsion be added, a kind of fermentation sets in and the amygdalin is gradually decomposed into benzaldehyde, glucose and hydrocyanic acid. Amygdalin has been produced synthetically by Emmerling from mandelic nitril glucoside and glucose, with maltase, a constituent of yeast.

AMYGDALOIDS, a-mig'da-loidz, cellular lavas, the cavities of which have been made by expanding steam before the lavas completely solidified, and which are usually filled with secondary minerals, frequently the zeolites (q.v.). The cavities are called amygdules and the rocks are said to be amygdaloidal. Amygdaloids are characteristically extrusive. On Keweenaw Point, Mich., they are of particular interest, because the cavities are filled with native copper and constitute the source of much of the copper mined in that region.

AM'YL (from the Latin *amylum*, "starch," its first-known compounds being obtained by the distillation of fermented starchy matter), an important organic radical having the formula C_5H_{11}, and belonging in the fatty series. It is also called "pentyl," because, in the long list of analogous radicals having the general formula C_nH_{2n+1}, amyl is the particular radical in which $n=5$. Amyl cannot exist in the free state, but two of its molecules can combine to form the paraffin "decane," $C_{10}H_{22}$, which is a liquid boiling at about 320° F. The radical amyl can have no less than eight different isomeric forms, and the chemistry of its compounds is correspondingly complicated. Of the many compounds that are known, however, only three are especially important in the arts. These are: (1) Amyl alcohol, (2) amyl acetate and (3) amyl nitrite.

(1) Eight isomeric amyl alcohols are theoretically possible, one for each of the theoretically possible isomeric forms of the radical itself, and seven of these are actually known. Five of the seven are of no particular importance in practical chemistry, but the remaining two, known respectively as the "active" and "inactive" amyl alcohols, constitute the greater part of the fusel-oil (q.v.) that is obtained abundantly in the manufacture of potato brandy, and less abundantly in the preparation of many other kinds of distilled liquors. "Active" amyl alcohol has the formula $CH_3.CH.C_2H_5.CH_2.OH$, boils at about 262° F., and takes its name from the fact that it rotates the plane of polarized light to the left. "Inactive" amyl alcohol has the formula $(CH_3)_2.CH.CH_2.CH_2.OH$, boils at about 269° F., solidifies at −4° F., and has no effect upon polarized light. These two kinds of amyl alcohol may be obtained, mixed, by washing fusel-oil with water and subsequent rectification. They may then be separated by fractional distillation or by other more exact methods, for which see special treatises.

(2) Amyl acetate (more exactly, "iso-amyl acetate," since six acetates are known) is prepared by distilling a mixture of the foregoing amyl alcohols with sodium acetate and sulphuric acid. It is a liquid, boiling at about 282° F., and possessing a strong fruit-like smell. It is used for flavoring cheap confectionery.

(3) Amyl nitrite, $C_5H_{11}.NO_2$, may be formed by distilling a mixture of the foregoing amyl alcohols with potassium nitrite and dilute sulphuric acid. It is a yellow liquid, with an ethereal, fruity odor. When its vapor is inhaled it paralyzes the vaso-motor nervous system and lowers the blood pressure. Amyl nitrite is often administered in the form of glass capsules or "pearls" containing one to three drops, which are crushed in the handkerchief and inhaled. It is used in arteriosclerosis, angina pectoris, migraine, asthma, hæmorrhage and toxic rise of blood pressure. Its effects are powerful and almost instantaneous, and it should never be tried except under the guidance of a physician.

AMYLENE HYDRATE, an alcohol used as a hypnotic. It is technically a tertiary iso-amyl alcohol $[(CH_3)_2C(OH)CH_2CH_3]$, and is a limpid, colorless, neutral fluid with a peculiar odor and a burning taste. It is miscible with eight parts of water and freely miscible with alcohol, chloroform and fixed oils. It has an action on the human body similar to that of other alcohols and is a useful hypnotic, occupying a position between chloral, which is twice as strong, and paraldehyde, which has about half the strength of amylene hydrate. In large doses it is a heart depressant.

AMYLOP'SIN, a chemical (or unorganized) ferment, occurring in the pancreatic fluid, together with steapsin and trypsin. The chief function of amylopsin, in intestinal digestion, is to effect the conversion of starches and similar substances (amyloses) into sugars (dextrins, maltoses, isomaltoses and glucose). The conversion takes place in the small intestine. Amylopsin is often called the "pancreatic diastase." See PANCREAS.

AM'YLOSE, any carbohydrate (q.v.) which can be classified as starch, dextrin, cellulose or natural gum. The remaining members of the carbohydrate group are classed as glucoses or saccharoses. The general formula of an amylose is $(C_6H_{10}O_5)_n$. See CARBOHYDRATE; CELLULOSE; DEXTRIN; STARCH; GUM ARABIC.

AMYNODONTS, a group of primitive solid-hoofed animals, fossil in American Eocene rocks, especially in the White River beds. They were large, heavy, short-legged animals, allied to the rhinoceros, but having probably more the appearance and habits of a hippopotamus. Well-known genera are *Amynodon* and *Metamynadon*.

AMYNTAS, ą-mĭn'tăs, the name of various characters in ancient Greek or Macedonian history, especially kings of Macedonia. Amyntas I was a son of Alcetas, reigned about 540 to 500 B.C. and was succeeded by his son, Alexander I. Amyntas II, sometimes called Amyntas III, was King of Macedonia, son of Philip and

brother of Perdiccas II; reigned 393 to 369 B.C., having gained the crown by the murder of Pausanias. He was engaged in war with the Olynthians and assisted by the Spartans. He was father of Alexander, Perdiccas and the famous Philip. Philip excluded Amyntas III (or IV), the grandson of Amyntas II from his succession and he was put to death in the first year of the reign of Alexander the Great because of a plot against the life of Alexander. Another Amyntas was a Macedonian officer in Alexander's army.

AMYNTOR, ą'mĭn-tôr, **Gerhard von** (pseudonym of DAGOBERT VON GERHARDT), German novelist and poet: b. Liegnitz, Silesia, 12 July 1831; d. 1910. He entered the army in 1849, took part in the campaigns of 1864 and 1870–71 as a major, was severely wounded in the former and resigned in 1872; settled in Potsdam in 1874. His principal works are 'Peter Quidam's Rhine-Journey' (1877), an epic; 'Songs of a German Night Watchman' (1878); 'The New Romancero' (1880), poems; 'The Priest' (1881), an epic; novels, 'It Is You' (1882); 'A Problem' (1884); 'Praise of Woman' (1885); 'Gerke Suteminne' (1887), a historical romance; 'A Struggle for God' (1902).

AMYOT, Jacques, ă-mē-ō', a French author: b. 30 Oct. 1513; d. 6 Feb. 1593. He is famous for his translations from the Greek, which, owing to their elegant style, are considered classical literature. They are the 'Theagenes and Chariclea' of Heliodorus; 'Seven Books of Diodorus Siculus,' the 'Daphnis and Chloe' of Longus; and 'Plutarch's Lives,' which was used by Corneille as a source for his antique tragedies, and by Shakespeare (in its English version by Sir Thomas North) for some of his plays.

AMYOT, Joseph M. See AMIOT.

AMYRAUT, ą'mē-ro, **Moïse,** French Calvinist theologian: b. in Bourgueil, in the province of Anjou, 1596; d. 1664. He was educated at Saumur, where he was himself afterward a professor of divinity. By his talents and moderation he soon acquired reputation and influence. In 1631 he attended the Synod of Clarendon and was commissioned to present to the king the remonstrances of his brethren against the infraction of the edicts of pacification. In his mission he acted with such judgment and dignity that he succeeded in relieving the Protestant deputies from the disgraceful obligation of addressing the king on their knees. Although he was a Protestant, his amiable temper and courteous manners commanded the regard of the Catholics and he was held in particular esteem by Cardinal Richelieu. He endeavored to bring about a complete union between the various Protestant Churches; this object he had in view in nearly all his writings, especially in a Latin tract, '*De secessione ab ecclesia Romana, deque pace inter Evangelicos in negotio religionis instituenda.*' Moreover, acting in concert with Richelieu, he aimed at a reconciliation between the Protestants and the Roman Catholic Church. The favor and respect with which he was treated by the heads of the French government Richelieu and Mazarin, are to be ascribed to his opinions concerning the power of the princes. He publicly maintained on several occasions the doctrine of implicit obedience to the sovereign authority, which, indeed, had also been held by the great founders of the Reformation. Amyraut was a finished scholar and wrote Latin and French with equal ease. His numerous writings, which were received with marked favor in his time, are now nearly forgotten and not easy to be procured. Among the number we may mention 'A Treatise on Religions, Against Those Who Esteem Them to Be Indifferent'; 'Christian Morals'; 'A Treatise on Dreams'; 'Against the Millenarists'; 'Considerations on the Laws of Nature Regulating Marriage.'

AMY'RIDACEÆ, a natural order of tropical plants, consisting of trees or shrubs with opposite or alternate compound leaves, frequently stipulate and dotted; the flowers are usually bisexual, but are sometimes unisexual by abortion. They yield resinous and balsamic juices, which are sometimes used medicinally and receive such names as bdellium, elemi, frankincense, myrrh, oliban, tacamahac. (See these articles). Among the chief genera of the order are *Amyris, Balsamodendron, Boswellia, Canarium* and *Icica.* They are sometimes classed as a suborder of *Anacardiaceæ.*

AN, or **ON,** the Egyptian name of the city of Heliopolis.

ANA, a comparatively modern designation applied to collections of the sayings and observations of eminent persons, as well as to gossip or criticism pertaining to them.

ANABAPTISTS (Greek), *ἀνά,* again, *βαπτίζειν* to baptize), those who baptize again persons admitted to their communion, when such converts have been baptized in their infancy or have been merely sprinkled and not immersed in baptism or have been baptized in any way without being capable of declaring the doctrines which they believe and giving a reason for the hope that is in them. Baptists (q.v.) of the present day are not properly to be styled Anabaptists, as they lay no capital emphasis upon the necessity for rebaptism, although they have very definite canons on the subject of immersion.

Anabaptists of the early Church.— In the 3d century of the Christian era, the century which witnessed such violent and bitter controversies, the question of baptism came also under discussion. In the Eastern Church, including Asia Minor, Egypt, northeastern Africa and Constantinople, it was definitely maintained that baptism was invalid unless it was administered by one of the clergy with proper matter and form. In the Western Church, including Italy, Gaul, Spain and northwestern Africa, it was held that the virtue of baptism lay in the invocation of the Trinity and the ceremonial sprinkling with or immersion in the water. Any baptism thus administered by a person of either sex, by a clergyman or a layman, was equally valid. When two children in their play mimicked the act of a priest whom they had seen baptizing an infant, Saint Augustine of Hippo declared that the boy who had been thus baptized by his companion was a real and actual partaker of the benefits and bound by all the vows pertaining to this sacrament. The controversy between the East and the West continued,

however, to rage with such fury that two councils were called to settle the question. The one was held in Iconium, Asia Minor, in 235, the other at Synnada in 256. At these theological synods the decision arrived at was that rebaptism was unnecessary for those who had been baptized by heretics. The storm of controversy swept westward to northern Africa as far as Carthage, where Tertullian supported the position of the Eastern Church in contrariety to that of Saint Augustine and other Western doctors. Agrippinus, bishop of Carthage, maintained against the bishop of Rome that baptism under certain circumstances ought to be repeated. His followers were called Agrippinians and his defiance of the bishop of Rome took the form of a concilier decree which was issued by a synod which he convened and which endorsed the sentence of Iconium. In the year 253 Stephen, bishop of Rome, fulminated a bull of excommunication against all the bishops of Asia Minor, including Cappadocia, Galatia and Phrygia, whom he styled Rebaptizers and Anabaptists, in an opprobrious sense.

Münster Anabaptists.— In the 16th century there arose in Europe a religious sect known as Anabaptists, whose main tenets carried the principles of the Reformation to the extreme limit of that revolutionary movement. Their principles were those of revolt against mediæval feudalism just as much as against ecclesiastical authority. They were socialists as well as reformers, mystics and fanatics. Their existence was one of the results of the Renaissance as interpreted to the common mind. Their views were democratic and individualistic. They rejected all authority, all tradition, all dogma, everything in short that militated against the absolute independence of the individual mind and spirit. This tendency acquired at length the character not only of liberty but of license, and the term Anabaptist has thus become associated with every extreme, not only of license but of licentiousness, of rebellion and political outlawry. It is quite absurd to associate the term Anabaptist as employed historically with any phase of Christian thought, practice or opinion. It really is a term applied to those who at a turning point in the history of European thought, social, political and religious, became intoxicated with the idea of individual liberty and the result was violence and excess of the worst character.

The history of the movement is as follows: The doctrine of adult baptism was first put forth by Thomas Münzer, the Lutheran pastor of Zwickau in Saxony, in the year 1520. Münzer soon obtained many followers who joined him in his uprising against all civil and religious authority. Although openly belonging to the Reformation movement they very soon became completely repudiated by the followers of Luther and his adherents. But the spirit of insurrection against feudal tyranny prevailed amongst all the common people on the Rhine, in Westphalia, Holstein, Switzerland, Flanders and throughout the whole Netherlands, and the increase of Münzer's followers became so dangerous that the magistrates and civil authorities found it difficult to restrain them. Münzer was compelled to leave Zwickau; he visited Bohemia, resided for two years at Alstadt and Thuringia and in 1524 was found propagating his doctrines in Switzerland. He was the principal inciter of the Peasants' War, which was entered upon with a view of establishing an ideal Christian commonwealth with communistic institutions. This war reached its culmination in 1525, when Münzer led his forces against the representations of established order and was defeated at the battle of Frankenhausen 15 May 1525, Münzer was taken prisoner and with several of his associate leaders was tried, condemned and executed. But all this was looked upon by the Anabaptists as merely a form of welcome persecution. New associations were formed; new prophets and teachers arose; the propaganda was extended amongst the peasants and serfs of Germany, Austria and Hungary in every direction. It may be necessary to state that the tenets of the Anabaptists are to be summarized in their own words as follows: "Impiety prevails everywhere. It is therefore necessary that a new family of holy persons should be founded, enjoying, without distinction of sex, the gift of prophecy, and skilled to interpret Divine Revelations. Hence, no need for learning; for the internal word is more than the outward expression. No Christian is to be allowed to go to law, to hold an office in the civil government, to take an oath in a court of justice or to possess any personal property; everything amongst Christians must be in common."

John Bochhold, or Bockel, a tailor, of Leyden, aged 26, and John Matthias, or Matthiesen, a baker of Haarlem, came, in 1553, to Münster in Westphalia, a town whose inhabitants followed the doctrines of the Reformation. Here they soon won the adherence of the excited populace, and among the rest, of Rothmann, a Protestant clergyman, and the Councillor Knipperdolling. The magistrates in vain excluded them from the churches. They took violent possession of the council-house, and toward the end of the year a treaty was signed securing the religious liberty of both parties. Being strengthened by the accession of the restless spirits of neighboring cities, they soon made themselves masters of the town by force, and drove out their adversaries. Matthiesen came forward as their prophet, and persuaded the people to devote gold and silver and movable property to the common use, and to burn all books but the Bible; but in a sally against the bishop of Münster, who had laid siege to the city, he lost his life. He was succeeded in the prophetic office by Bochhold and Knipperdolling. The churches were destroyed, and 12 judges were set over the tribes, as in Israel; but even this form of government was soon abolished, and Bochhold, under the name of John of Leyden, raised himself to the dignity of king of New Zion, as the Anabaptists of Münster called their kingdom, and as such was ceremoniously crowned. From this period (1534) Münster was the scene of all excesses of fanaticism, lust and cruelty. The introduction of polygamy, and the neglect of civil order, concealed from the infatuated people the avarice and madness of their tyrant and the increase of danger from abroad. Bochhold lived in luxury and magnificence; he sent out seditious proclamations against the Pope and Luther, as well as the neighboring authorities; he threatened to destroy with his mob all who differed in

opinion from him; made himself an object of terror to his subjects by frequent executions, and while famine and pestilence raged in the city, persuaded the wretched, deluded inhabitants to a stubborn resistance of their besiegers. The city was at last taken, 24 June 1535, by treachery, though not without a brave defense, in which Rothmann and others were killed, and the kingdom of the Anabaptists destroyed by the execution of the chief men. Bochhold, and two of his most active companions, Knipperdolling and Kretchting, were tortured to death with red-hot pincers, and then hung up in iron cages on Saint Lambert's steeple, at Münster, as a terror to all rebels. In the meantime, some of the 26 apostles, who were sent out by Bochhold to extend the limits of his kingdom, had been successful in various places; and many other teachers, who preached the same doctrines, continued active in the work of founding a new empire of pure Christians, and propagating their visions and revelations in the countries above mentioned. It is true that they rejected the practice of polygamy, community of goods, and intolerance toward those of different opinions, which had prevailed in Münster; but they enjoined upon their adherents the other doctrines of the early Anabaptists and certain heretical opinions in regard to the humanity of Christ, which seemed to result from the controversies of that day about the sacrament. The most celebrated of these Anabaptist prophets were Melchior Hoffmann and David Joris. The former, a furrier from Suabia, first appeared as a teacher in Kiel in 1527; afterward, in 1529, in Emden; and finally in Strasburg, where, in 1540, he died in prison. He formed, chiefly by his bold promises of a future elevation of himself and his disciples, a peculiar sect, whose scattered members retained the name of Hoffmannists in Germany till their remains were lost among the Anabaptists. They have never owned that Hoffmann recanted before his death. David Joris, or George, a glass-painter of Delft, born in 1501, and rebaptized in 1534, showed more depth of mind and warmth of imagination in his various works. In his endeavors to unite the discordant parties of the Anabaptists, he collected a party of quiet adherents in the country, who studied his works (as the Gichtelians did those of Böhme), especially his book of miracles, which appeared at Deventer in 1542, and revered him as a kind of new Messiah. Unsettled in his opinions, he traveled a long time from place to place, till at last, to avoid persecution, in 1554, he became a citizen of Basil, under the name of John of Bruges. In 1556, after an honorable life, he died there among the Calvinists. In 1559 he was accused, though without much reason, of profligate doctrine and conduct, and the Council of Basil ordered his body to be burnt.

Undoubtedly by no means all the Anabaptists of Germany indulged in social and political excesses. The fanaticism which characterized some of the early Anabaptists is sufficiently explained by the tendency of human nature to rush into extremes. The iron hold of the ecclesiastical hierarchy, which had cramped the Church for ages, being suddenly relaxed, men had yet to learn what were the genuine conditions whether of civil or religious liberty. But these considerations were overlooked, and the reformed churches, with one consent, regarded the Anabaptists with horror and disdain. The correspondence of the Reformers is full of allusions to the subject. Anabaptists are spoken of with reprobation, and a distinction is not sufficiently made between the sober Christians and the worst fanatics of the party. It is probable, at least, that their faults have been exaggerated even by the best writers. Menno Simons inaugurated a new and prosperous era for the Anabaptists. He gathered together the scattered remnants of the sect and founded numerous congregations in Germany and the Netherlands. Later they became known as Mennonites, and are now known as Taufgesinnte in Germany, and as Doopsgezinden in Holland. These terms are very close to the English term Baptists, and avoids all association with the early Anabaptists. Menno explained his doctrine in his work 'Elements of the True Christian Faith,' which is still authoritative among the sect. Especial emphasis is laid on a reception of the doctrines of Scripture with simple faith and conforming one's life to them, at the same time making no special prize of learning or the scientific explanation or elaboration of doctrines. Oaths, war, revenge, infant baptism, divorce, except for adultery, are repudiated, as also undertaking the functions of magistrates, who are regarded as a necessary present evil, in no wise necessary to God's kingdom. Grace is universal and the Church is the community of the saints, whose purity is to be maintained by strict discipline. In Germany and Switzerland their worship is closely akin to that of the Lutherans. Bishops, elders and instructors receive no remuneration. Children receive their name at birth, adults joining the body are rebaptized and baptism takes the place of worship. About the beginning of the last century all the congregations of Holland were merged into one body. Consult Lindsay, 'History of the Reformation' (Vol. II, New York 1907).

ANABASIS. The Anabasis is the story in which Xenophon tells how the Ten Thousand (really some 14,000) Greeks in the year 401 B.C. went up with the younger Cyrus to help him oust his brother Artaxerxes from the Persian throne. 'The Anabasis' proper, i. e., the *going up*, covers only the first book; the remaining six books tell how these Greeks, under Xenophon's leadership, came back down to the sea and finally got home. Xenophon's story, which has been for ages the first book read by students in a classical course, has made the brilliant and generous but unfortunate young Persian prince one of the best known characters in the world's literature; as the inimitable account of perhaps "the most famous retreat in military history," it has also immortalized the author and made him one of the most fascinating figures in Greek history. It is mainly a story of adventure in distant lands and in large part among almost unknown primitive peoples, offering a wealth of material, ethnological and geographical; incidentally also valuable information as to the constitution of the Greek army and its spirit, so much like that of the popular assembly at Athens. The purpose of the book? It may have been intended partly as an *apologia* or refutation of criticism of Xenophon's conduct of the expedition. It was probably intended also to indicate to his countrymen how rotten at the core was the Persian

empire, ready for some other Agamemnon to lead against it another victorious Hellenic host, as indeed Agesilaus attempted to do in 396 B.C. "Xenophon could not see all that was meant in the future by the expedition in which he shared as soldier and historian; yet the premonition of it is everywhere cheerfully present; and even in the later books, when little has to be told but of trial and loss, there is still apparent the serene confidence of a nation that was already preparing itself for another Anabasis, which should be no mere brilliant and ineffectual episode, but the sure foundation of a new order of things. It is in this way that the Anabasis of Cyrus, as recorded by Xenophon, was the prologue and preparation for the mighty conquests of Alexander." (Marshall).

For the general reader the 'Anabasis' will remain simply a very interesting account of the most important episode in Xenophon's experience — a story of warlike adventure and exploit told in clear and simple, if not always the purest, Attic Greek. It is very far from being "Xenophon's military stuff" which "we force upon our boys," as the editor of the *Review of Reviews* said to a classical club. So the classics must suffer sometimes even from would-be friends. I found the story fascinating when I read it in Greek at fifteen and when I came to edit it at fifty kept thinking, "How ridiculously interesting and easy it is!" A few years ago a professor of English, who is author of half a dozen books in prose and verse, came to me, after rereading the 'Anabasis,' jubilant over the interest of the story and the art of the story-teller. "A more delightful yarn it would be hard to find," he said. Its best lesson to the modern, in the way of style, will doubtless always be its clearness and simplicity, in proof of which let one passage, which is perhaps the best of many fine ones, be cited. The weary and footsore Greeks had been for many months marching and fighting through desert and mountain wilds when at last a guide came and told them he could lead them in five days to a place whence they could see the sea. "If I don't," said he, "you may put me to death." "On the fifth day they came to a mountain named Theches. And when the foremost reached the summit a great shout arose. Xenophon and the rear guards heard it and thought other enemies were attacking in front. . . . But as the cry grew louder and nearer and the men as they came up ran forward to join those that were shouting, and the cry became louder as the number grew larger, Xenophon, thinking it something serious, mounted his horse and with Lycius and the horsemen went to the rescue. Soon they heard the soldiers shouting 'The sea, the sea!' and passing the cry along. Then all ran, even the rear guards, and the pack-animals and horses were urged on. And when all reached the summit they wept for joy and embraced one another and the generals and captains. Suddenly someone gave the word and they brought stones and made a great heap, on which they placed a great number of raw hides and staves and captured shields, the guide himself cutting up the shields and exhorting others to do this." Under somewhat similar circumstances many a man has since remembered this scene and repeated the cry. General von Moltke relates that when he and his attendants first saw near Samsun the gleaming sea, "the same that drew from the Greek soldiers their celebrated θάλαττα, they too broke into shouts of joy." Best of all is Virgil's imitation:

> Italiam, Italiam primus conclamat Achates,
> Italiam læto socii clamore salutant.

For an extended discussion of the 'Anabasis,' both from a historical and military point of view, consult Goodwin and White, 'Anabasis'; the introduction to Dakyn's 'Works of Xenophon' (Vol. I); article "Xenophon" (in 'Dictionary of Greek and Roman Biography'); Hertzberg, 'Der Feldzug der Zehntausend Griechen.'

CHARLES FORSTER SMITH,
Professor of Greek and Classical Philology, University of Wisconsin.

ANABLEPS, a genus of fishes of the order *Malacopterygii Abdominales,* family *Cyprinidæ* (Cuvier), family of *Cyprinodontidæ* (Agassiz). It is characterized by a structure of the eyes to which there is nothing similar in any other vertebrated animal. This consists in a division of the cornea and iris into two somewhat unequal elliptical parts by transverse bands, so that the creature seems to have four eyes, and there are really two pupils on each side. This peculiar structure is supposed to have been formed for the purpose of enabling the fish to see both above and below water, as it swims along the surface. The fish itself is elongated, scaly, with a flat, rounded back and depressed head. The young are born alive and in a considerably advanced stage of development. It occurs along the coasts and the rivers of South America, keeping to the shallow waters. The creature cannot dive to any depth, but is capable of moving over mud flats.

ANABOLISM, the building-up process of organic life. The term metabolism (q.v.) is used to express the interchange of the life process constantly going on in living plants and animals.

ANACAONA, ä'nạ-kä'ō-nạ, or **GOLDEN FLOWER,** Haitian princess, sister of Behechio and wife of Caonabo, both chiefs of the Indians of Haiti when Columbus discovered that island, in 1492. On her brother's death she became the head of the tribe, and after the death of her husband remained on friendly terms with the Spaniards until 1503, when she gave a feast in honor of Ovando, the Spanish governor, in the midst of which she was put to death by his order.

ANACARDIACEÆ, ā'na-kär'di-ā'cēē, a family of dicotyledonous plants, consisting of trees and shrubs, with acrid, resinous sap, sometimes irritating and poisonous. It embraces about 50 genera and 500 species, mostly confined the only species indigenous to the United States. to the tropics. The sumach and poison oak are The most important genera are the *Mangiferæ, Spondicæ, Rhoideæ* and *Semecarpeæ.* Resins and tannins are obtained from all, and are valuable for the manufacture of lacquers, varnishes and tanning materials. Wholesome and agreeable fruits are produced by some of the species, and are extensively cultivated in the tropics. See MASTIC GUM; MANGO; PISTACIA; SUMAC.

ANACHARSIS, ān'ạ-kär'sĭs, the name of a Scythian philosopher who flourished about

600 B.C. and was a friend of Solon, by whose influence he was received into Athenian society. Returning to Scythia, he was put to death because of his performance of certain Greek religious ceremonies. Modern readers have been familiarized with the name through J. J. Barthélmy's famous 'Voyage du Jeune Anacharsis en Grèce' (1788).

ANACHRONISM, an inversion of chronclogical relation, unintended or otherwise. In common parlance it is confined to the antedating of customs or events, particularly in imaginative works with a basis of history.

ANACONDA, Mont., city, the county-seat of Deer Lodge County, 27 miles northwest of Butte, on the Northern Pacific, Great Northern and Butte, Anaconda & Pacific railways. It was founded in 1884, following the erection of its great copper-smelting works, which are the largest in the world. They treat daily between 5,000 and 10,000 tons of ore mined in the vicinity. The copper produced by the Washoe Reduction Works of the Anaconda Mining Company comprises 10 per cent of the world's output. Deposits of graphite and sapphires are found near the city. Anaconda has also large railway shops, brick works, machine-shops and other manufactories, banks, telephone and telegraph service, and daily and weekly newspapers. It has parks, likewise a race track and fair grounds, Hearst Free Library containing about 6,000 volumes, two opera houses and a daily and weekly newspapers. Anaconda has grown rapidly with the development of its great copper industry. In 1880 it was a small mining camp; 10 years later its population was 3,975. Pop. (1910) 10,134; (1913) 12,500.

ANACONDA, a South American constricting serpent, the water-boa (*Eunectes murinus*). This is the largest of the boas (q.v.), and like the Ceylonese python (to which the name originally belonged), may exceed 30 feet in length. It inhabits the swampy forests of the Amazonian region, where it is unpleasantly numerous and greatly feared by the natives, although not at all aggressive toward mankind, which it seeks to avoid rather than to attack. Like other boas it may hang from tree-limbs awaiting chance prey passing beneath, which it may seize and, by throwing powerful folds about its body, crush to death, meanwhile holding firmly to its support by its prehensile tail. Having crushed the animal, if large, into a sausage-like mass it descends and slowly swallows it, after which it lies quiet for a long time while the meal is digested. In captivity, for these reptiles are common in zoological gardens, several months sometimes elapse before another meal is wanted. It is rarely found far from water, and the larger part of its time, as a rule, is spent lying in the water or partly submerged on the bank, where it can seize small aquatic animals and swimming birds, which constitute most of its fare. The nostrils in this species open at the top of the snout in adaptation to this aquatic habit. During the day these water-boas live in holes in the bank, whose entrances are likely to be under water, and usually go forth only at night in search of food. Although strong enough to overcome animals as large as a jaguar or a crocodile, it will not attempt to swallow one larger than a medium-sized dog. The females produce their young alive at irregular but long intervals and in varying numbers, one captive specimen in New York yielding 34 at a birth; but few of these survive the risk of drowning or the attacks of eagles, peccaries and other enemies.

The markings of the anaconda are leopard-like, the coat being greenish yellow above with one or sometimes two series of large, blackish cross-spots, and a lateral line of dark spots with white centres. The belly is gray spotted with black.

ERNEST INGERSOLL.

ANACORTES, Wash., city in Skagit County, 90 miles north of Seattle, on the Great Northern Railroad. It is a port of call for several steamship companies. The prominent features of the city are the Carnegie library, Cap Santa Park and Deception Pass. It has good water power facilities which are used to advantage in the city's industries, comprising lumber mills, fish-curing and canning plants, oil and glue works, glass and box works and shipyards. The city is governed by a mayor and council. Pop. 6,000.

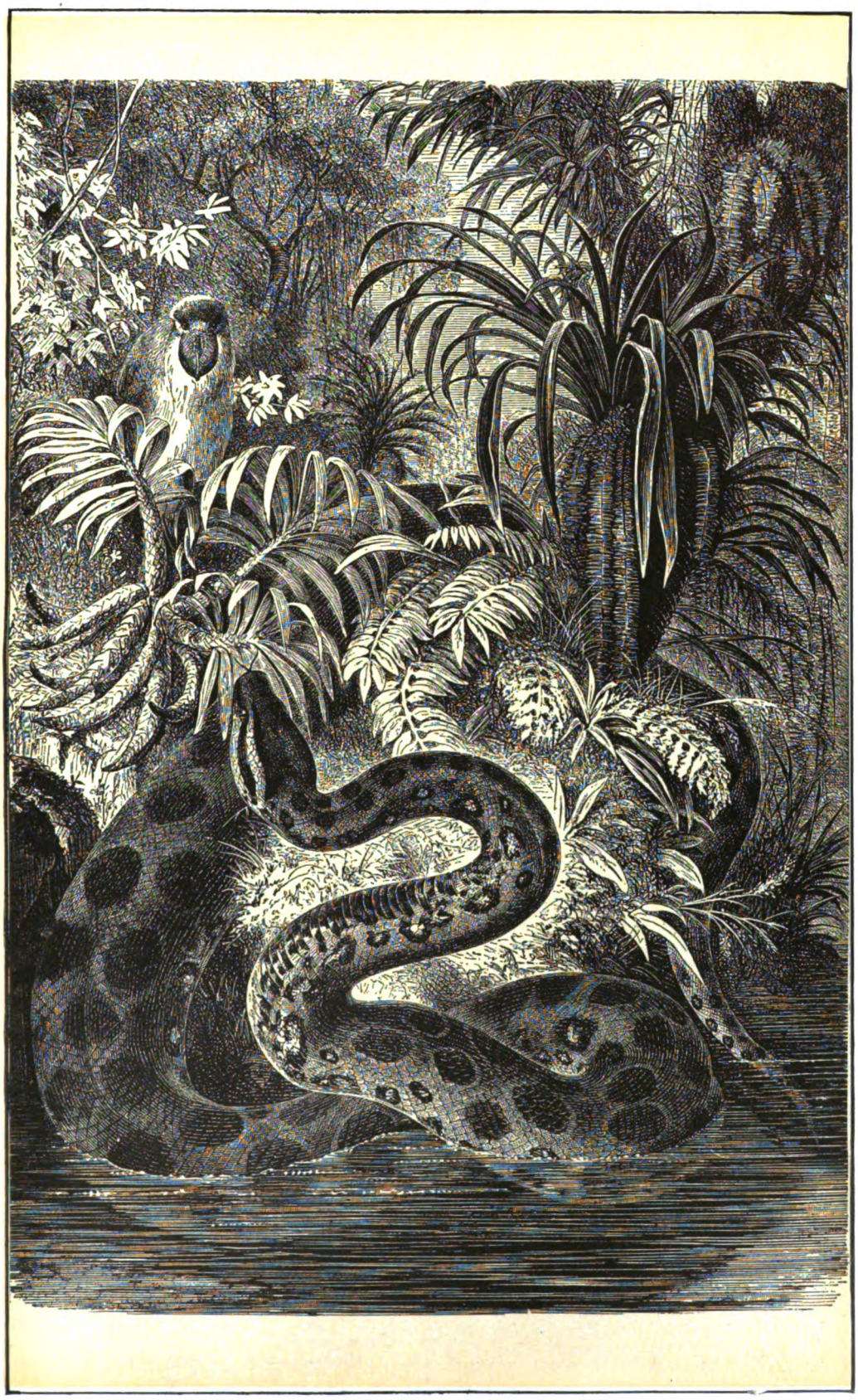
ANACREON. The Anacreon of history was born at Teos in Asia Minor (hence Byron's "Teian muse") in the 6th century B.C. and, driven thence by the Persian invasion, lived at the courts of Polycrates of Samos and Hipparchus, tyrant of Athens. He sang in a variety of lyric measures of love and wine and revelry, and also wrote hymns to the gods and some serious epigrams in the Greek sense of the word. The Alexandrian scholars possessed his poems in five books, of which about 15 pages of fragments remain. Here are two specimens in rough renderings:

Love's purple ball my heart hath hit
And with a dainty-slippered chit
He lureth me to play.
But she from Lesbos' island rare
Disdainful views my whitening hair
And looks another way.

Why with timid sidelong glances
Dost thou flee from my advances
Thracian colt, and in thy fancies
Hold my cunning in disdain?
Know that could I but come near thee
I could bridle, bit, and gear thee
And around the stadium steer thee
Past the goal with skilful rein.

Anacreon thus became the type of the Dionysian old man, the white-haired bard of wine, love and song. It was later a fashionable literary exercise to compose in his name little verses on these themes. Thus without any conscious intention of forgery arose the collection of so-called Anacreontea which, preserved in the Palatine Anthology, has usurped the name and fame of the true Anacreon. They are not in the Ionic dialect; they do not refer to the details of Anacreon's life; they are rarely if at all quoted by the ancients as of Anacreon; they are composed not in the variety of Greek lyric measures, but in a monotony of tripping iambics; for the mighty god Eros of Anacreon they substitute a bevy of Alexandrian or Pompeian Eroses; they are obviously spurious.

The publication of Stephanus' edition of the Anacreontea in 1554 was a literary event of the



ANACONDA (Eunectes murinus)

revival of letters which Ronsard saluted in this strain:

> To Stephanus I quaff this cup
> Through whom black Hell hath rendered up
> And given back to our desire
> Anacreon's lost sweet Teian lyre.

From France the fashion of Anacreontea passed to Germany where successive generations of 17th and 18th century rhymers and readers delighted in such verse as Gleim's

> Rosen pflücken, Rosen blühen
> Morgen ist nicht heut!
> Keine Stunde lass entfliehen,
> Flüchtig ist die Zeit.

In England Anacreontics were written under that name perhaps first by Cowley, and in form of paraphrase, free translation or imitation by William Oldys, John Sheffield, Duke of Buckinghamshire, John Phillips, Charles Cotton, John Hughes, William Hamilton, John Cunningham, William Shenstone, William Thompson, William Somerville and other bards buried in Chalmers' Johnson's poets, as well as by Herrick, Gray, Prior, Garth, Parnell, Allan Ramsay and Tom Moore.

Among the favorite motives of Anacreontea and Anacreontics are the order for a picture (paint the portrait of my love); Eros swallowed in a draft of wine; lines to a drinking cup; the women tell me I am old — but; his countless loves — *mille é tre*; to a swallow; to the dove; to the happy grasshopper; all things drink, why not I; fain would I sing of epics and war, but the strings of my lyre echo only love; I would I were thy mirror, etc., the motive of the song in Tennyson's 'Miller's Daughter'; bulls have horns and lions teeth and women beauty; the origin of roses; love and the bee; love the lost child admitted from the midnight storm and rewarding his benefactor by a shaft from his bow — a theme varied in countless imitations.

PAUL SHOREY,
Greek Department, University of Chicago.

ANAC'REON'TICS (from the name of the Greek poet Anacreon), the title given to short lyrical pieces, of an easy kind, dealing with love and wine. The English word was first used by Abraham Cowley in 1656, who called a section of his poems "anacreontiques," because they were paraphrased out of the so-called writings of Anacreon into a familiar measure which was supposed to represent the metre of the Greek. Half a century later John Phillips (1631–1706) laid down the arbitrary rule that an anacreontic line "consists of seven syllables, without being tied to any certain law of quantity." The best known "anacreontics" are those of the Irish poet, Thomas Moore.

ANADARKO, Okla., city and county-seat of Caddo County, 50 miles southwest of Oklahoma City, on the Washita River, and on the Chicago, Rock Island and Pacific. It is located in a prosperous agricultural district and has a large trade in corn, cotton, wheat, vegetables, fruit and other agricultural products. It contains cotton-gins, grain elevators, and oil and flour mills. The principal features of the city are its Indian schools, the county courthouse, Chautauqua auditorium and city park. The city owns the electric-lighting plant and the waterworks. The electric plant is operated by water power secured by a dam in the Washita River. Pop. 4,000.

ANADIR, ā'nä-dir, or **ANADYR BAY,** a large inlet of Bering Sea, much frequented by whaling-vessels. It is about 250 miles wide, a peninsula of half that breadth lying between it and the Arctic Ocean.

ANADIR, or **ANADYR,** the most easterly of the larger rivers of Siberia. It rises in the Stanovoi Mountains, and falls into the Gulf of Anadyr after a course of some 400 miles.

ANADYOMENE, ăn'ą-dī-ŏm'ē-nē, a surname of Venus, and referring to her as rising from the sea. It was applied by the ancients to a picture by Apelles, which represented the goddess emerging from the waters.

ANADOLI HISSAR, also called GUZEL HISSAR, a village and castle on the Bosporus, seven miles northeast of Constantinople, of which city it is a suburb. The castle, which is variously ascribed to Bayazid I and Muhammad I, consists of four round towers with a central square keep, which latter is called the Black Tower, from the darkness of its walls, within which many state prisoners ended their days. The castle is now in ruins and a habitat for numerous cranes, which are held in great respect by the Turks. Near by are the Sweet Waters of Asia (q.v.).

ANÆMIA, literally without blood, popularly poorness of blood. In medicine, however, it may signify a reduction of the amount of the blood in its entirety, in its corpuscles red or white, or in one particular or important ingredient, as the red coloring matter of the blood, the hemoglobin. Anæmia is divided into primary and secondary anæmia. Primary anæmia includes two diseases entitled: Chlorosis (q.v.) the green-sickness of young girls; and pernicious anæmia (q.v.), a disease of the blood-making organs. Secondary anæmia may be broadly subdivided into acute and chronic anæmia. Acute anæmia is due to hæmorrhage either external or into one of the body cavities. Chronic anæmia on the other hand may be due to a number of causes which may be generally noted as follows: Continued losses of blood, inanition, infectious diseases, malignant and long-continued wasting diseases, parasites, notably in the hook-worm disease, *Uncinaria* (the poor whites of the South, earth-eaters, etc., seem to be typical examples); or from intoxications from inorganic poisons, lead, mercury, copper, arsenic, carbon dioxide, etc., or from organic internal intoxication as in nephritis and pregnancy. See BLOOD DISEASES.

ANÆSTHESIA. In its simplest sense this term means simply absence of feeling and has been handed down to us from a very respectable Greek antiquity. We cannot get behind this. There may be anæsthesia of a part of an organ or of a special sense or of the entire sensorium, but it is all want of feeling, want of sense perception in the part or the whole. The term, like so many of the Greek terms, is basic and inclusive. We moderns are accustomed to say there is a general and a local anæsthesia according as the entire sense of feeling is obliterated or only a section of it. There is a general anæsthesia in sound sleep, in profound stupor or coma, in surgical shock, in

the unconsciousness which comes from the inhalation of certain vapors and the influence upon the sensory centres of poisonous drugs, and in the rare conditions called trance and intense mental concentration when mind seems to be carrying on an independent existence apart from matter. The examples of local anæsthesia are innumerable; tie a string around your finger, cutting off its nerve and blood supply, and feeling in the finger disappears; continue this long enough and you can have the finger cut off without knowing it, or the finger may drop off, being dead and no longer a part of the living organism. Interfere with the circulation of your foot by pressure or constrained position, and you say it is asleep and has no feeling in it; freeze it and you may cut it or prick it or pinch it without wincing. Inject under the skin solutions of certain drugs or even distilled water and if properly done you may cut the skin and the tissues which are under it and even invade one of the cavities of the body and cut out diseased organs or new growths without excessive pain, perhaps with very little or none as is now being done by skillful surgeons every day. Such is the marvelous control which men have gained by experience and investigation over the natural operations of physical functions.

How is this brought about? Consciousness is governed by the interaction of the blood and the nervous system. Remove a sufficient quantity of blood from anybody and consciousness ceases. If you were to look at the brain, the centre of consciousness, of one who had lost this blood, you would find it pale instead of red as it is when the blood is flowing through it; its blood vessels would be more or less collapsed instead of distended. This is probably what happens during natural sleep. There may be other factors, too, about which there has been much speculation and investigation, but this is the principal one.

When the brain is anæmic or when the blood flowing through it is poisoned by certain drugs there is an arrest of consciousness. This is general anæsthesia; there is no feeling either of pain or pleasure in any portion of the body. The skin, including the mucous membranes lining certain cavities of the body, is the principal organ of sensation. We get sensations through the eyes, the nose, the ears, the mouth, but the skin, the organ of touch, is by far the most extensive and there is no portion of it which does not respond more or less actively to the impression of contact with matter in any form, to heat and cold, hard and soft, solid, fluid and gaseous.

We are conscious of this contact by means of the peripheral nerves, the sensory nerves, which are distributed to each infinitesimal portion of the skin and which converge to trunk nerves going to the spinal cord, by which the impressions are conveyed to the brain and there interpreted. If this line of communication is cut or otherwise interrupted the impression cannot reach the brain and there is local anæsthesia or want of feeling at that portion of the skin where the contact was made and where under ordinary circumstances there would be consciousness of the contact.

Among the most important applications of general and local anæsthesia has been the abolition of painful impressions in the skin by the influence of medicine and surgery. Ancient medicine knew of drugs that would relieve pain, but not many of them. We read of the somniferous poppy, and mandragora and hellebore rubbed into the skin or taken into the stomach, and wine has been celebrated from time immemorial as the unfailing remedy for hurts of mind and body. Ancient surgery was even more deficient than medicine in its means for relieving pain. Those who were compelled to undergo surgical treatment, whether in civil or military life, usually had to bear the pain if they could, and they had the consciousness of pain just as we do. If they could not bear it they succumbed, and that was the frequent accompaniment of surgical operations, far more frequently than now. The abolition of pain in very many of the hurts of life, in the painful neuralgias, in the throes of childbirth, in civil and military surgery is now a relatively simple matter by both general and local anæsthesia.

When the anæsthetizing influence of the inhalation of the vapors of ether and chloroform was announced to the world it was the dawn of a new era; it was a gift which can be appreciated only by remembering the pains of those who were deprived of it. Modifications and variations of these two substances have been devised from time to time, but they have not lost their supremacy and probably they never will. The unfavorable effect which their use often has upon those whose organs are diseased, especially the liver, kidneys, lungs and heart, has led to the wide application and employment of local anæsthesia in surgical practice. The seat of painful sensations resting principally in the skin, it has been found that by infiltrating the skin or injecting into the cellular tissue beneath it suitable solutions of such substances as cocaine, stovain, novocain, etc., sufficient detachment of the peripheral nerves added to the anæsthetizing effect of the drugs upon the nerves will permit of the painless or nearly painless performance of even very extensive operations, and this is of the greatest advantage to those for whom general anæsthesia would be inadmissible or at least unadvisable. Anæthesia by way of the rectum and the spinal canal are devices of recent years which have had their day and a brief one, too. They have not commended themselves to surgeons generally and it is doubtful if they will ever come into general use. The use of scopalamine and morphine in obstetric practice, which has had a vogue in certain quarters within the past few years, but which is now subsiding, is not properly a method of anæthesia, but of analgesia or amensia.

ANDREW F. CURRIER, M.D.

ANÆSTHETICS, agents used to produce anæsthesia, a word first employed by Dr. Oliver Wendell Holmes. In early times it was known that pressure on the carotid arteries on each side of the neck could bring about temporary unconsciousness and resultant anæthesia. The gentle art of garrotting grew out of this generalized knowledge. Ancient peoples used opium, *Cannabis indica,* and alcohol to produce anæsthesia, particularly analgesia, or relief from pain, but it was not until the early part of the 19th century that the discovery of the general anæsthetics, nitrous oxide, ether and chloroform, was made, and still later the wonderful

developments made in the art of local anæsthesia by the use of cocaine and its congeners.

For remedial measures anæsthesia may be local or general. Cold from ice, or from freezing mixtures, ethyl chloride, etc., is a very efficient local anæsthetic for the performance of small operations, such as opening boils, felons, etc. A large number of drugs have the power of numbing the sensory nerves of the skin and are extensively employed to relieve itching and soreness. These are mostly of the phenol or carbolic acid group, thymol, menthol, etc. Even more efficient in its action on the sensory nerve filaments is the alkaloid cocaine, obtained from the South American coca plant. Applied in appropriate watery solution (2 to 4 per cent) to the mucous membrane of the ear, eye, nose, throat, urethra, vagina or rectum, it quickly brings about loss of all pain sensations, or, injected into the skin, causes complete anæsthesia over a circumscribed area, permitting of cutting operations. When injected into the spinal canal it brings about complete loss of pain sense in all portions of the body below the site of the injection, sometimes even more extensively. This method of inducing anæsthesia without loss of consciousness has some very advantageous features in surgical procedures and was first practised by a New York physician, Dr. J. Leonard Corning. Stovaine, discovered by Fourneau in 1904, is less dangerous in spinal analgesia than cocaine, and in this use has largely superseded that drug. Stovaine, when employed for this purpose, is often combined with strychnine. Alypin, novocaine and other drugs have in recent years been used in spinal analgesia and have been found satisfactory. Other related alkaloids, eucaine, holocain, have similar properties to cocaine. Still other compounds made by the synthetic chemist have been widely employed, principally as analgesics (q.v.).

General anæsthesia is usually brought about by the inhalation of some vapor. Nitrous oxid gas, chloroform, ether, ethyl chloride, etc., are those most frequently employed, especially the three former. Nitrous oxide (q.v.) was the first of this series to be suggested. It was made by Sir Humphry Davy in 1800, but was not used in practice until about 1844, when Dr. H. Wells, an American dentist, employed it in the extraction of teeth.

The anæsthetic properties of ether were known for some years before put to practical use. As to its first use there is much controversy. It seems certain that one Dr. Crawford W. Long of Georgia first used ether as a general anæsthetic, but to W. T. G. Morton, a dentist of Boston, should be given the credit for demonstrating its value and use to the medical profession. Long did his first operation under ether 30 March 1842, for the removal of a cystic tumor of the jaw. He reported his experiments to the Georgia State Medical Society in 1842. Morton's work was begun in 1846, on 30 September, when he extracted a tooth while the patient was under the influence of ether. He subsequently demonstrated his method at the Massachusetts General Hospital, and then patented his product under the name Letheon. The following year Sir J. Y. Simpson of Edinburgh announced the discovery of the anæsthetic properties of chloroform and demonstrated its value in obstetrics. At the present time all three of these anæsthetics are extensively employed. In recent years ethyl chloride has been employed quite extensively as a general anæsthetic in the same class of operations as nitrous oxide. It is inhaled, and is usually given by means of a mask fitting closely to the face and a small rubber bag connected with a bottle containing the drug. The patient becomes unconscious in a very few seconds. Its after effects occasionally are nausea, headache and vomiting. The mortality, it is claimed, is intermediate between that of chloroform and ether. In Europe chloroform is preferred; in this country ether is used more often. The statistics of deaths following these two shows ether to be the less dangerous, although it has more disagreeable after-effects than chloroform. Chronic bronchial and kidney disease contra-indicate the use of ether, while in respect to people with weak hearts chloroform is to be avoided. See CHLOROFORM; ETHER; NITROUS OXIDE. Consult Williams, Probyn, 'Guide to Administration of Anæsthetics' (New York 1901); Packard, F. R., 'The Discovery of Ether in the History of Medicine in the United States' (Philadelphia 1901); Overton, E., 'Studien über die Narkose' (Jena 1901).

SMITH ELY JELLIFFE.

ANAGNI, ą-nä-nyē, town of Italy, 40 miles east southeast of Rome. It was the birthplace of four Popes — Innocent III, Gregory IX, Alexander IV and Boniface VIII, and as the chief city of the Hernici was a place of importance during the whole period of Roman history. Virgil mentions it as "wealthy Anagnia." Pop. about 10,000.

ANAGRAM, a word or sentence resulting from the transposition of the letters of a given word or form of words. The most exact anagram, sometimes termed palindrome, is that formed by reading the letters backward — evil, for example, thus read, constituting live. The making of anagrams was a favorite mediæval amusement and is still an occasional pastime.

ANAHEIM, Cal., city in Orange County, situated in a fertile valley, 28 miles south of Los Angeles, on the Southern Pacific and the Atchison, Topeka and Santa Fe railroads. It contains a public library, high schools, Saint Catherine's Academy and several churches; has fruit canning and drying establishments and manufactories of sugar, beer, wine and brandies. There is also a large trade in oil, lemons, oranges and farm and dairy products. Anaheim was settled on a co-operative plan in 1857 by 50 German families and was incorporated in 1878. For its early history consult Nordhoff, 'Communistic Societies of the United States' (New York 1895). Pop. (1910) 2,628.

ANAHUAC, ä'ną-wäk', a name applied to the great central plateau of Mexico, elevated from 6,000 to 9,000 feet above the sea and including more than the area of the republic. It contains several lakes, and Popocatepetl is the loftiest of the volcanoes which rise from it.

ANAÎTIS, ăn'ă-ī'tĭz, the Persian water goddess of antiquity, extensively worshipped in the East.

ANAKIM ("long-necked ones" = giants), a general term, like Amorites or Rephaim, used by the Hebrews for the pre-Jewish inhab-

itants of Palestine; but with special reference to the colossal stature accredited to them, as by others to the wild fierce tribes they encountered on first entering their adopted land. Like the Greek giants, they were mountain-dwellers (Josh. xi, 21–2), all through Judah and Israel as later divided, and apparently with palisaded strongholds at Hebron and other places. This passage says Joshua drove them thence, but that remnants survived at Gaza, Gath and Ashdod, then or later Philistine cities. An older passage, however, says in the Authorized Version that it was Caleb who expelled "the three sons of Anak," whose names are given, from "the city of Arba [Kirjath-Arba] (the father of Anak), which is Hebron." But this is a ludicrous misapprehension of the scribe. "Sons of the Anakim" means in Oriental phraseology clans of that people, here turned into a person with personal sons. The other part is still more grotesque. "Kirjath-Arba" means "city of four" (probably from the incidents of its settlement); but the scribe has taken "Arba" for a person. If the oldest text spoke of the city of the "father of the Anakim" (that is, their ancestral home), the metaphor is intelligible enough; but as such metaphors in the East are usually feminine, it is most likely the original said "mother of Anakim," and the copyist corrected a supposed error.

ANALCITE, a-nal'sīt (from the Greek word meaning "weak," in allusion to the feeble electric properties it manifests when heated or rubbed), a mineral usually classed as a zeolite, or hydrated double silicate of sodium and aluminum, with the formula $NaAlSi_2O_6 + H_2O$; although Doelter maintains that the water cannot be water of crystallization, and writes the formula thus: $NaAlSiO_4 + 2H_2SiO_3$. Analcite is commonly colorless or white, with a vitreous lustre. Its hardness is from 5 to 5.5, and its specific gravity about 2.26. It occurs in a variety of forms, but usually in trapezohedrons. There has been much controversy over its crystalline structure, owing to certain optical anomalies that it exhibits; but it is now usually referred to the isometric system, the weak double refraction that it often exhibits being probably due in part to anomalous internal stresses, and in part to a loss of water, and a consequent modification in molecular structure. Beautiful crystals of analcite are found near Mount Ætna and in Nova Scotia. In the United States the mineral occurs in the trap rocks of northern New Jersey, Colorado, California and the Lake Superior region. See LEUCITE.

ANALEMMA, a geometrical term implying the projection of a sphere upon the plane of a meridian with the point of sight an infinitely distant point of the radius perpendicular to that plane. This projection is sometimes styled orthographic. The sun-dial has been called an analemma, and the term has also been used to indicate a scale showing the declination of the sun and the equation of time of various periods of the year.

ANALGESIA (ä, neg., ἀ'λγος, pain), the loss of power to feel pain without loss of consciousness; e.g., in some nervous diseases or due to certain drugs. See ANALGESICS.

ANALGESICS, remedies used to control pain. These have come largely into use during the past 10 to 15 years. Before that time the profession had to rely chiefly on a few drugs, notably opium, cannabis indica, and their allies, for the relief of pain of nerve and muscle: neuralgia, acute rheumatism, sick headache and other transitory or persistent affections of the sensory nerves. Synthetic chemistry has introduced a large number of new drugs that have been found very useful in allaying pain and discomfort of many conditions heretofore borne with heroic stoicism. The commonest of these new remedies are antipyrine, acetanilide or antifebrin, and phenacetin. These are but a few of a large list of similar drugs. The numerous drug-store mixtures sold as headache powders, etc., are usually mixtures of the cheapest of these, acetanilide or antifebrin, with other products. See ACETANILIDE; ANÆSTHETICS; ANTIPYRETICS; PHENACETIN.

ANALOGUE, a term in comparative anatomy employed to denote resemblances, as an organ of an animal or plant performing the same function as another part in a second animal or plant differently organized. It is much used by geologists in comparing fossil remains with living specimens.

ANALOGY, a correspondence of relations between one thing and another.

In logic it implies the resemblance of relations, a meaning given to the word first by the mathematicians. To call a country which has sent out various colonies the mother country implies an analogy between the relation in which it stands to its colonies and that which a mother holds to her children.

As more commonly used it is a resemblance on which an argument falling short of induction may be established. Under this meaning the element of relation is not especially distinguished from others. "Analogical reasoning . . . . may be reduced to the following formula: Two things resemble each other in one or more respects; a certain proposition is true of the one, therefore it is true of the other." If a conjunction between a property in the one case and a property in the other finds its place in an established system of correlations, the argument rises above analogy, becoming an induction on a limited basis; but if no such conjunction has been made out, then the argument is one of analogy merely. If two bodies or processes agree closely in certain respects, it is reasonable to suppose that they will also agree in those respects which have been found to be associated therewith. Metaphor and allegory address the imagination, while analogy appeals to the reason. The former are founded on similarity of appearances, of effects or of incidental circumstances; the latter is built up on more essential resemblances which afford a proper basis for reasoning.

In zoology analogy is applied to the resemblance between the entire bodies, or between special structures of organs, in animals of unrelated types. Thus a whale is analogous in form to a fish: its paddles analogous to the fins of a fish. The wings of an insect are analogous to those of a bird. Analogy implies a dissimilarity of the ontogenetic and phylogenetic history of two organs, with identity in

their use or function, as the legs of a bird or quadruped and those of an insect. These analogies are the result of the adaptation of the animal to similar habits, modes of life or like environment, and result in convergence (q.v.), parallelism, and sometimes mimicry (q.v.) (see also HOMOLOGY). Osborn defines analogy in evolution as embracing similar changes due to similar adaptation in function both in homologous and in non-homologous organs, both in related and in unrelated animals. The different grades of analogy are shown by Osborn in the following table:

ANALOGY IN EVOLUTION.

Analogous Variation (Darwin): Similar congenital variations in more or less distantly related animals and plants.

Convergence: Independent similar development of unrelated animals, bringing them apparently closer together.

Parallelism: Independent similar development of related animals, plants, and organs.

Homoplasy (Lankester) (*Homomorphy*, Fürbringer): Independent similar development of homologous organs or regions giving rise to similar new parts.

ANALOGY OF RELIGION, The, a famous work by Bishop Joseph Butler, published in 1736. The full title is "The Analogy of Religion, Natural and Revealed, to the Constitution and Course of Nature." The author lays down three premises — the existence of God; the known course of nature; and the necessary limitations of our knowledge. These enable him to take common ground with those whom he seeks to convince — the exponents of a "loose kind of deism." In no sense a philosophy of religion, but an attempt to remove common objections thereto, the work is necessarily narrow in scope; but within its self-imposed limitations the discussion is exhaustive, dealing with such problems as a future life; God's moral government; man's probation; the doctrine of necessity; and most largely the question of revelation.

ANALYSIS. The act of decomposing or dissecting a thing, such as a substance, a process, or a logical concept, into its component elements, and of exhibiting its structure. The term is also used for an inventory of the results of this dissection such as we often find preceding a long and intricate article on any subject, and also occasionally for the state resulting from the dissection.

As mathematics is the study of pure structure, all mathematics which devotes itself to existing structures is of the nature of analysis. Accordingly, the word analysis, like the words "calculus" and "algebra," is often used as a synonym of mathematical discipline, as in the names "Analysis Situs," "Combinatory Analysis," etc. That phase of mathematics, however, which puts together old elements in new forms is sympathetic in character. Now, though both these phases go hand and hand in the history of every mathematical subject, the usual representation of geometrical entities has made the method of construction or the synthetic method peculiarly easy and universal there. On the other hand, algebra and, more especially, those sciences whose roots are in the infinitesimal calculus are characterized by the prominence which the analytic method possesses in their investigations and are often known by the collective name of *analysis*. Geometry and analysis usually appeal to different types of mathematicians, who are known respectively as geometricians or analysists.

Another mathematical use of the term is its application to the method in which you suppose the theorem you wish to prove demonstrated, reason back to some admitted truth, and then try to retrace the steps by which you have attained it. As to analysis in chemistry see CHEMICAL ANALYSIS.

ANALYSIS SITUS. Let a geometrical figure — say a closed surface in common space — be subjected to any change of form (bending, stretching, etc.) that does not involve any "tearing" or "joining." An extensible rubber model will suggest the possibilities of such deformation. Whatever properties of our figure are unalterable by this process from the subject matter of *analysis situs*, which may therefore be defined as the *theory of invariants of the group* (or groups, see this term) *of continuous deformations*. Its scope, however, is not confined to common space, but embraces, in general, m-dimensional figures in n-dimensional space (more briefly: R_n for n-space, also m-surfaces for m-dimensional surfaces, etc.).

The effect of *tearing* a surface or making an *incision* on it along a line is to double the latter. As the incision proceeds it substitutes for each point P of the line two points, P_l, P_r, henceforth not to be considered as consecutive, and whose successions separately constitute the left and right edges of the incision. *Joining* is the opposite process, each point of the juncture consisting of twin points merged into one. Corresponding definitions apply to incision and juncture along surfaces of two or more dimensions, or when the elements considered are straights, planes, etc., instead of points.

It will here be noticed that figures which are not continuously deformable into one another, or *equivalent*, in n-space, may become so by virtue of the additional freedom of deforation that $n+1$-space affords. The figure of two concentric circles in a plane is not equivalent to two circles excluding one another, but becomes so in 3-space. Hence a distinction arises between *absolute* analysis situs, which places its figures in space of any suitable number of dimensions, and analysis situs *in a given space or surface* within which all deformation must take place.

C. Jordan has shown that in the case of 2-*dimensional surfaces* the following four invariants form a complete system. This means that any two surfaces agreeing in these data are equivalent: (1) the number of detached portions of which they consist, and, with regard to each of these: (2) the number of curves bounding it; (3) its connectivity; (4) its laterality (unilateral or bilateral type). Evidently the first and second of these could be changed by incision or juncture only.

Connectivity.— A surface is *connected* if it permits of continuous passage on it between any two of its points. The standard of connectivity is the area of a plane triangle, circle or equivalent figure, which is called *simply-connected* or *elementary*. On it any two curves C_1, C_2 (not intersecting themselves or each other) between two points, A, B, are equivalent, and taken together they form a closed curve which divides the plane into two separate portions. This latter property received analyti-

cal demonstration from Jordan (hence "Jordan curves") and has lately been based on the theory of assemblages by Veblen. Using Poincaré's notation we write

$$C_1 \equiv C_2 \text{ or } C_1 - C_2 \equiv 0,$$

where the negative sign means that the curve is to be taken in the opposite direction (from B to A), and equivalence to zero means unlimited contractibility. A spherical or ellipsoidal surface is also simply connected, with this difference, that closed curves, if one obstacle (a small circle or "puncture" of the surface) be placed in the way of their contraction, may still be reduced to zero by deformation in the opposite direction. Consider, for instance, the intersection of such a surface with a movable plane as the latter moves parallel to itself in either of two directions.

Extending our definition of equivalence to zero, to sums of curves on any surface, it becomes necessary to stipulate (1) that the order of terms of a sum must be preserved (non-commutative addition) and (2) that any portions of curves, if deformed so as to coincide and form negatives of one another, shall cancel. Thus on the surface of the double ring (Fig. 1) we have

$$C_1 + C_3 = C_2 \text{ or } C_1 + C_2 - C_3 \equiv 0.$$

Curves form an independent set on a surface if none and no sums of them are equivalent to zero. Curves containing portions equivalent *inter se* (as when coiling several times about a

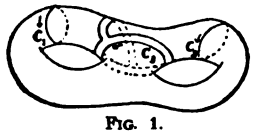


FIG. 1.

cylinder) shall here be excluded. *Multiply-connected* surfaces are then said to have *connectivity* c if they permit of c independent paths between any two points A, B. The connectivity of a closed surface, i.e., one without boundary and yet having all its points at finite distances, is not changed by puncturing it. For instance, the intersection of the double ring of Fig. 1 with a plane remains equivalent with itself (and to zero) no matter how the plane moves.

Taking B at an infinitesimal distance from A all paths between them but those equivalent to the shortest one approach closed curves (Fig. 2). Hence there are $c-1$ independent

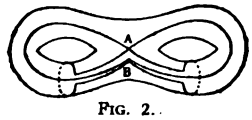


FIG. 2.

closed curves on a surface of connectivity c. Conversely, an independent set of $c-1$ closed curves does not divide the surface (for this would give rise to an equivalence between those bounding any portion of it) and can readily be so connected with two points A, B, as to form (after slight changes) $c-1$ paths from A to B, in addition to which there is the direct line joining these points.

Connectivity is often investigated by the *method of sections*. The latter are incisions of three types: (1) *cross-sections* between two points on the boundary. They may be *bound-severing*, if drawn between points of the same bounding-curve, or *bound-joining*, if between different ones. The former increase, the latter diminish, the number of boundaries by unity; (2) *re-entrant sections*, along closed curves, each furnishing two new rims; (3) σ- (sigma-) sections starting at a boundary point and ending at a point of their own right or left edge. These contain a re-entrant section and a bound-joining section, and increase the number of bounding-curves by unity. For exceptions to these statements see the paragraph on unilateral surfaces.

Limiting our investigations to surfaces any sufficiently small area of which may be considered simply connected, we may divide any one, or system of several, of them by a sufficient number (q) of cross-sections into (say, e) elementary areas. Since cross-sections start at a boundary, we must give a boundary to closed surfaces by puncturing them, i.e., taking out an infinitesimal area somewhere. The difference $c-q$ then proves characteristic of our system of surfaces, and in fact is known as its *characteristic*: $K = e - q$.

To prove this, let a second division, by q' cross-sections, yield e' elementary areas. Superpose the tracings of both divisions and let there be t crossings of the proposed incisions. Then the e areas left whole by the first division will be cut $q'+t$ times by the second, or the e' areas of the second $q+t$ times by the first. Both sets of incisions thus furnish $e+q'+t = e'+q+t$ parts, which proves the proposition. We also see that the characteristic of a system of surfaces is the sum of their individual characteristics.

Any surface can be rendered simply connected by means of $1-K$ cross-sections, for let the q cross-sections which divide it into e elementary areas be traced, and let them meet in v vertices. Consider this division as a map of e districts, the traces, counted from vertex to vertex, being its frontiers. Between any adjacent districts obliterate one frontier (thereby also removing two vertices). Repeat this operation on the new map, etc., until but one district remains. By what we have proven, the totality of remaining frontiers then constitute $1-K$ cross-sections.

On the other hand the $c-1$ nearly closed curves connecting A with B (see above) can readily be turned into cross-sections if we first draw a re-entrant section in a circle of diameter AB, thereby "puncturing" the surface. Hence, on closed surfaces, $c-1 = 1-K$, or $c = 2-K$, and if we retain this formula, the connectivity of a system of m surfaces will prove to be the sum of the individual connectivities, diminished by the number $(m-1)$ of junctures necessary to make one surface of the system:

$$c = \Sigma c_i - (m-1) = 1 + \Sigma (c_i - 1).$$

Kronecker's researches have led to an *analytical expression for the characteristic* of a closed analytical surface $f(x, y, z) = 0$. Let $f(x, y, z)$ be negative in the interior of this surface, and consider the family of surfaces $f(x, y, z) = \lambda$. As λ increases from $-\infty$ to 0, the surface has no real part at first, then, through the stage of isolated points or curves, real surfaces will develop. An isolated point develops into an ellipsoidal surface, increasing K by 2, while a closed curve (without multiple

points) becomes an anchor-ring, leaving K unchanged. This, or the opposite, may occur several times as the parameter increases. Also, double points of the surface may arise, in the neighborhood of which the surfaces resemble one- or two-sheet hyperboloids, changing from the one shape to the other as the double-point stage is passed. In each of these cases the increase of K is found to be

$$-2 \operatorname{sgn} \begin{vmatrix} f_{11} f_{12} f_{13} \\ f_{21} f_{22} f_{23} \\ f_{31} f_{32} f_{33} \end{vmatrix},$$ sgn (signum) meaning ± 1

according as the determinant is positive or negative, and 0 if it is 0, and

$$f_1 = \frac{\partial f}{\partial x}, \quad f_2 = \frac{\partial f}{\partial y}, \quad f_3 = \frac{\partial f}{\partial z}, \quad f_{11} = \frac{\partial^2 f}{\partial x^2} = \frac{\partial f_1}{\partial x},$$

$$f_{12} = \frac{\partial^2 f}{\partial x \partial y} = \frac{\partial f_1}{\partial y}, \text{ etc.,}$$

being partial derivatives.

Examples.— (1) The surfaces formed by rotation of the lemniscates $[(x-a)^2 + y^2][(x+a)^2 + y^2] - a^4 = \lambda$ (Fig. 3) about the x-axis. For positive λ they present single sheets of ellipsoid connectivity ($K=2$), for negative λ, pairs of sheets of the same kind ($K=4$). Within an infinitesimal sphere about the origin the transition is from the one-sheet to the two-sheet hyperboloid, as λ decreases through zero. At $\lambda = -a^4$ the two sheets become isolated points and vanish ($K=0$). (2) The surfaces formed by rotation of the same

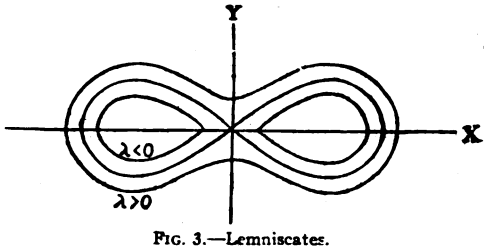


FIG. 3.—Lemniscates.

lemniscates about the y-axis. At $\lambda = -a^4$ they reduce to an isolated curve and vanish without changing the characteristic ($K=0$).

Thus K becomes $-2\Sigma \operatorname{sgn} \begin{vmatrix} f_{11} f_{12} f_{13} \\ f_{21} f_{22} f_{23} \\ f_{31} f_{32} f_{33} \end{vmatrix}$, the

sum to be taken over all points of intersection of the three surfaces: $f_1=0$, $f_2=0$, $f_3=0$. Moreover, this expression lends itself to transformation into the integral by means of which Gauss represents the "total curvature" of the surface $f(x, y, z)=0$, so that we finally get:

$$K = \frac{1}{2\pi} \text{ total curvature.}$$

Connectivity of Riemann Surfaces.— If w be an n-valued algebraic function of the complex variable z (see COMPLEX VARIABLE), let all values of z be represented on a spherical surface. Superpose radially n copies or sheets of this surface and imagine that for one value z_0 for which the n w-values are distinct, one value of w belongs to each z_0, i. e., to each of the n sheets. The values $w_1 \ldots w_n$ will vary continuously with z, constituting n branches of the function w. For some values of z, however, say for $z = b_1, b_2, \ldots, b_m$ some among the quantities $w_1 \ldots w_n$ will turn out equal. In these points we assume connection between the corresponding sheets, and denote them as branch-points. Such connection may not be feasible where other sheets intervene. In 4-space this difficulty would not arise. Limited as we are to 3-space, we may still *suppose* passage possible in these points between the sheets in question. Further, we find that whenever, starting at z_0, we take z in a loop (in all sheets simultaneously) about a branch-point, on returning to z_0 the values $w_1 \ldots w$ will have undergone a permutation typical of that branch-point. We prevent such loops, and render the branches single-valued, by means of incisions hrough all the sheets concerned, from z_0 to each branch-point. We further join every left edge of these incisions with the right one that exhibits the same w-values. This process (which, strictly speaking, again calls for a fourth dimension) completes our Riemann surface.

If we use a circular punch to cut out neighborhoods of the m branch-points (through all the sheets), the portion punched out at b_i, where first β_{i1} then $\beta_{i2} \ldots$ sheets are connected, will show $n - (\beta_{i1} - 1) - (\beta_{i2} - 1) - \ldots$ distinct simply connected parts. Thus all branch-points furnish $\Sigma_i[n - \Sigma_j(\beta_{ij} - 1)]$ elementary areas. The neighborhood of z_0, similarly punched out, yields n separate circles. The remainder falls into n elementary surfaces by means of m incisions from z_0 to the branch-points, through all the sheets, therefore each counting for n cross-sections. Hence

$$K = 2n + \sum_{i=1}^{m} [n - \Sigma(\beta_{ij} - 1)] - nm = 2n - \Sigma_{ij}(\beta_{ij} - 1).$$

Laterality.— Granting that within a sufficiently small neighborhood of every point P, any of the surfaces we consider has two sides (right and left) distinguished by the two perpendiculars to be drawn from P, it may happen that some continuous path on the surface starting at P on the right side arrives at P on the left. side. The surface is then called *unilateral*; in the absence of such a possibility, *bilateral*. We have hitherto tacitly assumed the bilateral type for our surfaces.

Moebius called attention to the fact that a rectangular strip of paper $aba'b'$, if its sides ba, $a'b'$ be joined after a twist of 180°, as Fig. 4

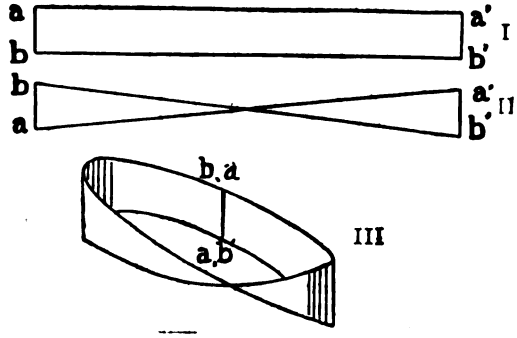


FIG. 4.— Moebius sheet.

directs, becomes unilateral. *Moebius' sheet* may conveniently be represented by folding the

rectangular strip into triangular shape as in Fig. 5. The folds may be distinguished as positive or negative according as, on our way from ab to $a'b'$, we pass from the lower to the upper sheet or the reverse. Each corresponds to a torsion or $\pm\pi$. Positive folds will cancel against negative ones. Evidently a strip folded into the shape of a polygon of an even number of sides will thus represent a bilateral surface; if the number of sides be odd, a unilateral one. Ruled surfaces of the third order contain the Moebius sheet (Masckke). Closed surfaces without double points are bilateral.

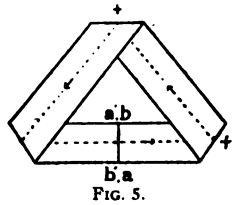


FIG. 5.

Indicatrix.—The two half-normals at a point P, not being in the surface, are more conveniently replaced by a small circle about the point, taken in a definite (say counter-clockwise) rotation about P. On the other side (of this point's neighborhood) the same rotation will be a clockwise one about P. Similarly, within the surface two infinitesimal perpendicular straight lines may be drawn, which if produced would form a right-handed Cartesian co-ordinate system (see ANALYTIC GEOMETRY) on one side (which we may define as the right one) and a left-handed one on the other. Such alternating contrivances are called *indicatrices* (Klein). They may be distinguished as *right* and *left*, or as *positive* and *negative*. If constructed continuously (i.e., without sudden transition to the opposite one) on continuous paths for all points that can thus be reached, one indicatrix will result for each point on a bilateral surface, while on a unilateral one a point will have both of them. Hence the term *double surfaces* for the latter type.

Unilateral Surfaces.—It will be noticed that Moebius' sheet has one continuous edge. Also, if we pursue any closed path, our direction of progress and a direction on the surface perpendicular to the former and pointing to the left may be taken as an indicatrix. Along some closed paths the latter will be reversed. A line

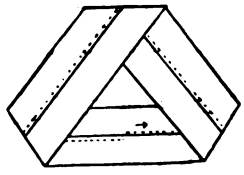


FIG. 6.

closely following such a path on its left will not close, as its beginning and end will be on opposite sides of the path. An incision along the latter evidently leaves our surface connected. Thus, on a unilateral surface, at least one non-dividing re-entrant section can be made. We shall call it a *bilateralizing* one. In fact, the number of bilateralizing re-entrant sections will be that of independent paths along which the indicatrix is reversed. This type of the re-entrant section, however, yields only one new bounding-curve. For only after completing a double circuit about the above closed path will the line following it on the left close in its turn, showing that the two edges of the incision blend into one. There also becomes possible a new kind of cross-section that leaves unchanged the

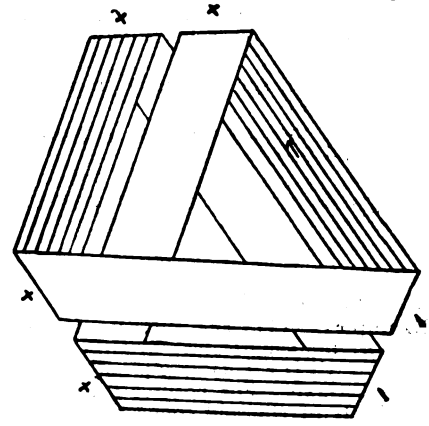


FIG. 7.—Effect of a bilateralizing re-entrant section on FIG. 6. One side is shaded.

number of boundaries (*bilateralizing* cross-section), as we see by merely tracing a bilateralizing re-entrant section and then making a cross-section that crosses the trace once between two points of one boundary.

Let our surface possess B bounding curves; let it become simply connected by virtue of b bilateralizing, s bound-severing, and j bound-joining cross-sections. Then $j=c-1-b-s$, and $B+s-(c-1-b-s)=1$ or $B+2s+b=c$. Since b is not zero, the number of boundaries of a unilateral surface will always be less than its connectivity: $B < c$.

Two Types of Unilateral Surfaces.—Draw a line connecting two points on different bilateralizing re-entrant sections. Make the bound-joining cross-sections $\acute{a}\grave{b}$ and $\grave{a}\acute{b}$ immediately to the right and left of it, and rejoin the re-entrant sections along the small portions $\acute{a}\grave{a}$ $\acute{b}\grave{b}$. The result will be a common re-entrant

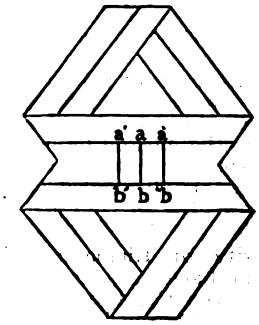


FIG. 8.

section. For follow by a line immediately to the left the re-entrant section from $\grave{a}$ to $\grave{b}$, the cross-section from $\grave{b}$ to $\grave{a}$, the other re-entrant section to $\acute{a}$ and, finally, the cross-section to $\acute{b}$. It will be seen that this line is closed, and so is the corresponding edge of the whole incision.

After this process of uniting bilateralizing

re-entrant sections has been repeated as often as possible, if b is even, no bilateralizing re-entrant sections remain; if b is odd, there will

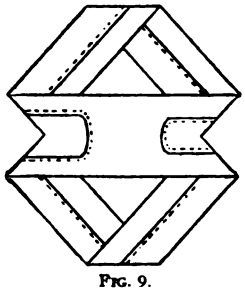


FIG. 9.

remain one. Accordingly, there are two types of unilateral surfaces:

(1) $B+2\left(s+\frac{b}{2}\right)=c$, b even: $B=2-c$, when the surface is unbounded ($B=0$), becomes 2, 0, -2, -4 . . .

(2) $B+2\left(s+\frac{b-1}{2}\right)+1=c$, b odd: $K=2-c=1, -1, -3$ . . ., when $B=0$.

The above surface (Fig. 9) is of the first type, even if extended so as to lose its boundary; $K=0$. Steiner's surface, which is equivalent to the projective plane, is of the second type; $K=1$.

Steiner's Surface.—Project the points of the projective plane from a centre C. On each projecting ray, whose length CP we call r, lay off the segment $\frac{r}{1+r}$ from C. The line at infinity will thus furnish a circle of radius unity, whose diametrically opposite points represent the same point (at ∞) of our plane. Now let the entire new surface, consisting of the ends of the segments laid off from C, be deformed into the plane area of this circle (Fig. 6). Cut the latter from C to E, roll it into a cone, putting CE on CE' (the edges of the incision on different

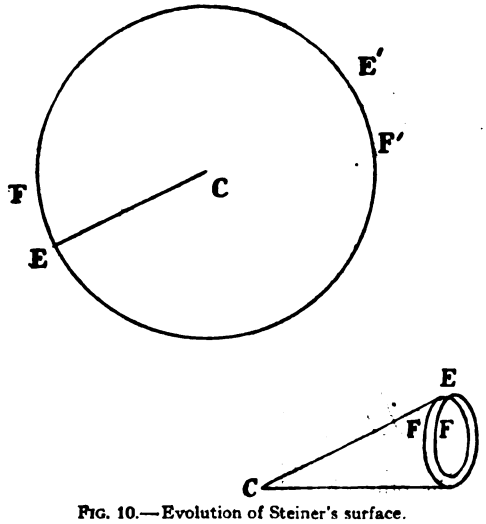


FIG. 10.—Evolution of Steiner's surface.

sides). Join the edges of CE (creating a double line) and also, by adjacent points, the two basal circles of the cone. This second juncture, by deformation of the surface, may be made to show continuous curvature, and the apex of the cone may be made to coincide with the centre of the circle of juncture. This is Steiner's surface (Fig. 11). By punching out its centre and cutting by a plane perpendicular to the double line we get three elementary surfaces. Hence $K=1$, also $c=1$, $b=1$, $B=0$.

Boy has devised similar surfaces and investigated the connection between the characteristic and Gauss total curvature in such cases.

Two connected surfaces possessing the same number (B) of bounding-curves, the same connectivity and, in case they are unilateral, the same number of bilateralizing re-entrant sections, can now be made simply connected by means of the same number of independent re-entrant sections. After a correspondence has been decided upon between the bounding curves,

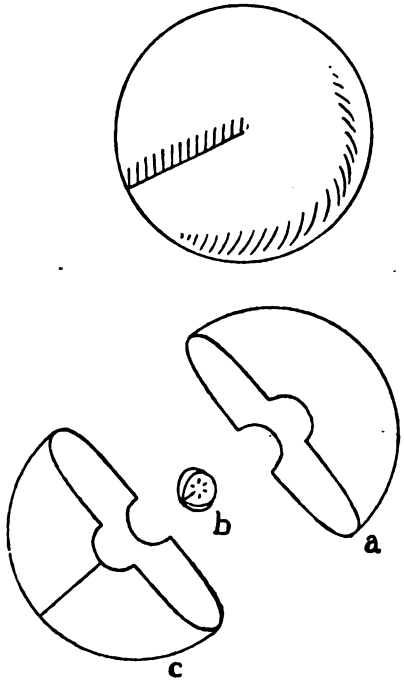


FIG. 11.—Steiner's surface and its connectivity.

we draw $c-1$ bound-joining cross-sections between pairs of corresponding ones and further establish a one-to-one correspondence between the points of the original bounding curves, also of these cross-sections. The resulting simply connected surfaces will have their boundaries corresponding point for point. Schoenflies has demonstrated that under these conditions between the points in the interior of the simply connected areas, too, a continuous one-to-one correspondence may be established. This proves the theorem of Jordan, to the effect that our surface is equivalent to the projective plane, which possesses any line as a bilateralizing section and is simply connected.

Space of n Dimensions.—The conceptions introduced in the analysis situs of two-dimensional surfaces in three-dimensional space permit of generalization. The indictatrix of an m-dimensional surface will consist of m direc-

tions in (i.e., tangent to) the surface perpendicular to each other. There will be only two indicatrices (right and left), since we may bring about coincidence between a first pair of axes of different indicatrices, then between a second pair, etc. To do this, in the case of the kth pair, we have $m-k$-space at our disposal. This becomes a common plane for the m — first pair. For the last pair there remains a line only, so that coincidence, if not existing, cannot be forced. As a consequence, unilateral and bilateral m-surfaces must be distinguished.

Examples.— The indicatrix of a line is the line-element (or the tangent) taken in one of two possible directions. A closed curve with a

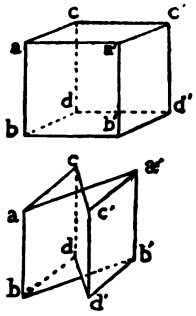


FIG. 12.

cusp might be considered one-sided, as the direction here changes abruptly as we make the circuit. A four-sided prism $abcda'b'c'd'$ in R_4 can be twisted like Moebius' sheet and its face $abcd$ joined to $c'd'a'b'$. The resulting surface is bounded by one bilateral 2-surface (from ab to cd=$a'b'$ and back to $c'd'$=ab) and two unilateral ones. We may further join these two latter 2-surfaces, their juncture only forming a unilateral surface such as we may imagine inside any solid. There will remain only one bounding bilateral 2-surface of spherical connectivity, just as Moebius' sheet has one edge. This further shows that an incision is possible along a surface of spherical connectivity, which does not divide our 3-surface, but renders it bilateral (bilateralizing closed section).

We shall now consider bilateral m-surfaces. They may be given by making the co-ordinates $x_1 \ldots x_n$ of a point in n-space, functions of m parameters $t_1 \ldots t_m$: $x_i = x_i(t_1 \ldots t_m)$. *m-planes* will then be linear functions. Lines common planes, etc., are m-planes for m=1, 2 . . .

In n-space, we call surfaces *complementary* if their dimensions add up to n, *dual* if they add up to $n-1$. In R_3, lines and 2-surfaces are complementary, while lines are dual to lines (self-dual).

Closed m-surfaces are boundless and contain no points with infinite co-ordinates. They separate the dual planes of n-space into interior and exterior ones. Taking any complementary plane (n—m-plane) that does not intersect the closed m-surface, we can move into it any *exterior* dual plane ($n-1-m$-plane) without allowing it to intersect the surface on the way, can reverse it there by turning it through 180°, and bring it back to its original position along the path on which it was brought. An *interior* $n-1-m$-plane, if we attempted to do the same, would describe an $n-m$-surface which must intersect the given m-surface. Besides distinguishing between the interior and exterior of our closed m-surface this also shows that the interior is bilateral, the exterior unilateral, with regard to the dual planes.

Examples.— (1) The limiting case of a closed figure without dimension is a couple of points. In 1-space (straight line) it bounds a segment. It separates the straights of 2-space (common plane) into those passing between it (interior) and the exterior ones, and does the same for the 2-planes of 3-space. (2) The interior of a circular circumference is an area in 2-space; in 3-space it consists of the straight lines passing through it. Take a plane not intersecting it: An exterior straight line may be moved into the same without coming in contact with the circle, may there be turned through 180° and brought back.—Although points cannot be reversed, it is as natural in an analysis situs as in projective geometry to assume unilaterality for the infinite plane. This is merely to extend to a limiting case what is true generally.

Interiors of Different Orders and Degrees. — In a plane a closed curve may have overlapping portions so as to contain a certain area twice or r times. In 3-space it may, without having any double points, coil r times about certain straight lines of its interior, which thereby become an *interior of the rth order.* But if, as we follow the curve in a given direction, it coils p times in an assumed *positive* rotation about this interior of rth order, and $r-p$ times *negatively,* we may then call $p-(r-p)=2p-r$ the *degree of the interior.* The curve C (Fig. 13) has an interior of order

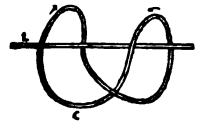


FIG. 13.— Interior of order 2 and degree 0.

2 and degree 0, to which line L belongs. These considerations are applicable to n-space, where $n-1$-surfaces, however, cannot possess interiors of higher orders without self-intersection (double points, etc.). Interiors of higher orders than the first can be removed by deformation, unless the curve is knotted (see below).

Locking of Dual Closed Curves.— In n-space a closed m-surface may be locked with a closed $n-1-m$-surface, as are the links of a chain. Through neither of them can a surface one dimension higher than it be laid that does not intersect the other. Examples: A point-couple and a circle enclosing one of its points in a plane. Two linked curves in R_3. For the latter, according to Gauss, the double integral

$$\frac{1}{4\pi}\iint \frac{\begin{array}{l}(x'-x)(dy\,dz'-dz\,dy')\\+(y'-y)(dz\,dx'-dx\,dz')\\+(z'-z)(dx\,dy'-dy\,dx')\end{array}}{[(x'-x)^2+(y'-y)^2+(z'-z)^2]^{\frac{3}{2}}}$$

x, y, z being a point of one curve, x', y', z' one of the other, has the value 1. In the case of one curve coiling repeatedly about the other, the order and degree of their interlocking may again be distinguished in accordance with the reflections of the preceding paragraph. Gauss' integral then gives the *degree,* which may hap-

pen to be 0 if the order be even. Two spherical surfaces transplanted into R_3 may interlock.

Knots.— Closed m-surfaces, in $2m+1$-space may lock with themselves. They are then said to form *knots*. The various shapes of knotted curves in common space have been extensively

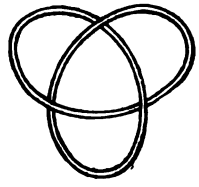


FIG. 14.—Trefoil-knot

investigated (Listing, Tait, Simony). These researches have been referred to as *topology*, a word also used synonymously with analysis situs. The simplest knot is the so-called trefoil-knot. It is formed by a curve of the sixth order whose equation in tetrahedral co-ordinates is given by Brill. It was thought that these knots might be forms of vortex-rings accounting for the differences of chemical elements. There are no knots in 4-space, surface-knots first becoming possible in 5-space, and, in their turn, dissolving in 6-space.

Generalized Connectivity.— m-surfaces will be called connected with regard to tangent lines, 2-planes, etc., if any two of these can be moved into one another without ceasing to be tangent to the surface. Two spheres in R_3 e.g., are disconnected as to points, connected as to tangents and tangent planes. The opposite is true for the faces of a polyhedron. But we shall assume that the surfaces considered possess all these connectivities. With regard to any of them they may be multiply-connected. Connectivity as to points (c_1) is the special case treated above. It has been referred to as cyclosis or periphraxy (Maxwell) in the case of portions of 3-space. The interior of an anchor-ring, e.g., has $c_1=2$.

The $c-1$ closed curves by means of which we determined the connectivity of a closed surface in 3-space will lock with other closed curves either in the space enclosed by the surface or in the exterior. We are thus led to consider the connectivity of the portion (R_3-S_2) left after subtracting from R_3 the points of our surface S_2.

Betti's Numbers of a Closed m-surface S.— Imagine S_m, if necessary after continuous deformation, placed in $m+1$-space. Find the connectivities $c_1, c_2 \ldots c_{m-1}$ of the remainder ($R_{m+1}-S_m$) with regard to points, lines, 2-planes, . . . $m-1$-planes. These are *Betti's numbers* $P_1, P_2 \ldots P_{m-1}$ of the surface S_m, ($c_k=P_k$). This means that in ($R_{m+1}-S_m$) there are P_k-1 independent closed k-surfaces with which certain $m-k$-surfaces within S_m may lock. Obviously, the $m-k$-surfaces may be deformed out of S_m into the remainder ($R_{m+1}-S_m$), while at the same time, and never ceasing to lock with them, the k-surfaces are deformed so as to be on S_m. This shows that P_{m-k} is at least equal to P_k, and vice-versa, so that finally $P_{m-k}=P_k$ on any closed bilateral m-surface without double points. Betti's number P_1 for a 2-surface is at the same time its connectivity c.

Euler's Polyhedron Formula.— The theorem holds for any division of a spherical surface into simply connected districts by frontiers bounded by the vertices in which they concur, that $v-f+d=2$, v, being the number of vertices, f of frontiers, and d of districts. Such a map is *regular* if each district has the same number f_d of frontiers, and if an equal number f_v of these concur in each vertex. We have $v=\frac{2f}{f_v}$, $d=\frac{2f}{f_d}$, and $f(2f_d-f_df_v+2f_v)=2f_vf_d$, where $2f_d-f_df_v+2f_v$ must evidently be positive. This gives rise to only five regular maps corresponding to the regular polyhedral surfaces of the tetrahedron (self-reciprocal), cube and octahedron (reciprocal to each other), dodecahedron and icosahedron (reciprocal). The regular 4-dimensional polyhedra are found to be six, viz., two self-reciprocal ones bounded by five tetrahedra and 24 octahedra respectively, one bounded by eight cubes reciprocal to one bounded by 16 tetrahedra, and one bounded by 120 dodecahedra reciprocal to one bounded by 600 tetrahedra.

Euler's formula, extended to maps on closed 2-surfaces of connectivity c: $v-f+d=3-c$ leads to a superior limit for the number of districts that may be adjacent each to each on such a surface. Heffter has investigated under what conditions this limit is actually attained, while H. S. White shows what regular maps (called by him *reticulations*) are possible for any given c. Generalizing still further, Euler's formula for a *map* on any m-surface, i.e , a division of it into simply connected parts, the dividing $m-1$-surfaces again being divided into simply connected partitions, etc., becomes:

$$\sum_{q=0}^{m-1}(-1)^q n_q = 1+\sum(-1)^q(P_{m-q}-1),$$

n_q being the number of q-dimensional parts or partitions on the map. Since for closed m-surfaces we have $P_k=P_{m-k}$, if m is even this becomes $\Sigma(-1)^q n_q=3-P_1+P_2\ldots-P_{m-1}$; if m is odd, $\Sigma(-1)^q n_q=0$ (Poincaré).

Literature.— Since no treatise on analysis situs has been published, a few of the main papers on the subject will here be mentioned. W. Dyck (*Math. Annalen* Vol. 32, p. 457) gives the literature preceding this article (to 1888). The pertinent publications of the savants named above are as follows: Listing, 'Der Census raumlicher Complexe' (*Göttinger Abhandlungen* 1861), and 'Vorstudien zur Topologie' (*Göttinger Studien* 1847); C. Jordan, 'Sur la déformation des Surfaces' (*Liouville's Journal* sér. 2, 11 1866); Klein, 'Uber den Zusammenhang der Flächen' (*Math. Annalen* 7, 1874); Moebius, 'Werke,' Band 2; 'Über die Bestimmung des Inhalts eines Polyeders' and 'Zur Theorie der Polyeder und der Elementarverwandtschaft'; Gauss, 'Werke,' V, p. 134; Kronecker (*Berliner Monatsberichte* 1869, p. 159, p. 688, 1873, p. 117, 1878, p. 95); Betti, 'Sopra gli spazi di un numero qualunque di dimensioni' (*Annali di matematica* 1870); Tait, 'On Knots' (*Trans. Roy. Soc. Edinburgh* 1879, 1884, 1886; also *Proceedings* of the same society, 1876 to 1879); Simony (*Math. Annalen* 19 and 24); Brill (*Math. Ann.* 18); Heffter (*Math. Ann.* 38); Boy (*Math. Ann.* 57); Maxwell, Theory of Electricity and Magnetism' (Vol. 1, p. 18); Veblen (*Trans. Am. Math. Soc.* 1905, p. 83).

Consult also the article on Analysis Situs by M. Dehn in the 'Encycklopedie der Mathematischen Wissenschaften,' and R. L. Moore, 'On the Foundations of Plane Analysis Situs.' (*Trans. Am. Math. Soc.* for 1916). The subject of analysis situs of higher dimensions, especially of 4-space, has been greatly advanced by the following six recent papers by H. Poincaré: 'Analysis Situs' (*Journal de l'Ecole Polytechnique* 1895); 'Complément à l'A. S.' (*Proc. London Math. Soc.* 1900); 'Second complément à l'A. S.' (*Rendiconti del Circolo matematico di Palermo* 1899); 'Sur certaines surfaces algébriques' (*Bull. Soc. Math. de France* 1902); 'Sur les cycles des surfaces algébriques' (*Journal de Math.* 1902); 'Cinquième complément à l'A. S.' *Rendic. Circ. mat. di Palermo* 1904).

PAUL WERNICKE.

ANALYST, in modern times, a person professionally skilled in chemical analysis. He may be called upon, in the discharge of his profession, to analyze a wide range of substances. Apart from private practitioners and those engaged in large manufacturing concerns, analysts employed by public bodies are termed public analysts. In most large manufacturing establishments there is usually a staff of analysts, whose duty it is primarily to exercise constant watchfulness over the processes of manufacture, to test the purity of the substances used, as well as that of the final products. The services of analysts are constantly required in judicial enquiries, sometimes in purely criminal cases, sometimes in civil proceedings, such as offenses against the customs or excise or under the various Food and Drugs Acts.

ANALYTICAL METRICS, or **NON-EUCLIDIAN GEOMETRY INTERPRETED ANALYTICALLY.** For a historico-critical account of the notion and developments of Non-Euclidian geometry from the standpoint of pure geometry — from the point of view of Lobatschewsky and Bolyai — the reader is referred to the article 'Non-Euclidian Geometry,' in this work. The aim of the following paragraphs is to present a readily intelligible account of the epoch-making concept by means of ideas familiar in analytical projective geometry, the point of departure and method being those of Cayley as modified and improved by Klein.

General Considerations Concerning Geometric Measurement.— Every problem of geometric measurement is reducible to one or the other or both of two fundamental problems: (1) to find the distance between two points; (2) to find the angle between two (intersecting) lines. Any two points belong to a range; any two (intersecting) lines belong to a pencil; a range and a pencil are one-dimensional spaces; so it is seen that the fundamental problems constitute the problem of measurement in one-dimensional spaces. In the projective geometry of the plane (see GEOMETRY, PROJECTIVE, and GEOMETRY, MODERN ANALYTICAL) we learn that the range and the pencil are related by the principle of duality, or reciprocity. A range and a pencil if rendered projective, i.e., if the range can be obtained by the repeated projection of the range established by the pencil on one of its transversals, are so related that the anharmonic ratio of any four points (or lines) is equal to that of the corresponding four lines (or points). Countless examples are met of the fact that in general to any point (or line) proposition there corresponds a line (or point) proposition; such pairs of propositions being so related that either proposition of a pair of reciprocals being given, the other can be found by merely exchanging the notions of point and line. This reciprocity does not, however, at first appear to be universal and all-pervasive. For example, the distance, $+\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$, between two points (x_1, y_1), (x_2, y_2), or $x_1\xi + y_1\eta + 1 = 0$, $x_2\xi + y_2\eta + 1 = 0$, is an *algebraic* function of the co-ordinates; while the angle, $\tan^{-1}\left\{(\xi_2\eta_1 - \xi_1\eta_2):(\xi_1\xi_2 + \eta_1\eta_2)\right\}$ of the lines (ξ_1, η_1), (ξ_2, η_2) or $\xi_1 x + \eta_1 y + 1 = 0$, $\xi_2 x + \eta_2 y + 1 = 0$, is a *transcendental* function of the co-ordinates. Sign being disregarded, a segment of a range is uniquely determined, while an angle of a pencil may have any one of an infinite series of values differing from each other by multiples of a period π, or 180°. Again a given segment is divisible by ruler and compasses into any chosen number of equal parts, while, by the same means, such division is possible in case of an arbitrarily given angle only if the division is to be bisection, quadrisection, etc., but not if it is to be trisection, for example.

It is such discrepancies in the general scheme of reciprocity that furnish the *motive* for seeking to generalize the ordinary conception of distance and angle measurement in such a way that the discrepancies shall disappear and that the principle of duality shall apply without exception. Such being the motive, on the one hand, the *possibility*, on the other, of making the needed generalization lies in the fact that, despite the differences indicated, the ordinary notion of distance and the ordinary notion of angular measurement have *two* fundamental properties *in common*. These are: (1) That the distances between points of a range or the angles between lines of a pencil are added in such a way that, if 1, 2, 3 denote three such points or three such lines, we have in the first case seg. 12 + seg. 23 = seg. 13, and, in the second case, ∠ 12 + ∠ 23 = ∠ 13. In particular, seg. 11 = 0 ∠ 11 = 0, whence it follows that seg. 12 = — seg. 21, and ∠ 12 = — ∠ 21; (2) the second of the common properties is that distance and angle are not altered in magnitude by displacement, where displacement of the pencil consists in rotating it as a rigid figure about its centre or vertex, and displacement of the range consists in moving it as a rigid figure along its base. These properties come clearly to light if we scrutinize the way in which distance and angle are not altered in magnitude. For this purpose we use a scale, which in case of the range consists of a segment divided into equal intervals by points, and in case of the pencil consists of an angle divided into equal intervals by lines. Each interval is a *unit* of distance or angle. Then to measure the distance (say) between two given points, we place any division of the scale on one of the points, and then *count* the number of intervals to the other given point. Analogously for angles. The first property above mentioned is used in determining the distance by counting the in-

tervals. The displacement property is employed in that we are indifferent as to which division of the scale we start with; that is, the distance or angle is found to have the same size if we measure, then displace the scale and measure again.

Generation of Ordinary Scale by Linear Transformation.— It is important to note that the displacement property enables us to construct the ordinary scale by means of a special linear transformation. Thus if x denote distance from a point assumed as origin in the range, then the transformation $x' = x + c$ will serve to generate the distance-measuring scale in which the unit, or interval, is c. If x be the distance from the origin to the point 1 chosen for initial point of the scale, then x' will denote the second division point 2. A second application of the transformation will convert point 1 into point 2 and point 2 into a third point 3 of the scale; and so on. The transformation for generating the angle-measuring scale is $x' = (x + \tan\gamma)\ (1 - x\ \tan\gamma)$, γ being the unit of angle and x being tangent of the angle of any line of the pencil with a line assumed as origin.

Generalization by Means of Transformation $z' = (az + b) : (cz + d)$.— The ordinary scales being generable by *special* linear transformations, the possibility is suggested of generating by more general transformations more general scales that shall involve and disclose more general concepts of distance and angle. We will first suppose the fixed elements of the transformation to be distinct (real or imaginary). Taking these as elements of reference O_1 and O_2 for homogeneous co-ordinates x_1 and x_2 in range or pencil, the transformation will assume the form $z' = \lambda z$, where $z = x_1 : x_2$, and where λ is the characteristic constant of the transformation. The constant λ will be subject to the condition that real elements (points or lines) z shall be converted into real elements z' and that, in case the reference elements $z = 0$ and $z = \infty$ are real, λ shall be positive.

If now we apply the transformation successively to an arbitrarily chosen element $z \equiv z_1$ we shall obtain a series of elements $z_1, \lambda z_1, \lambda^2 z_1, \lambda^3 z_1, \lambda^4 z_1, \ldots$. This series of elements constitutes our scale. Obviously this scale is converted into itself by the transformation $z' = \lambda z$ by which it was generated just as the old scales are converted respectively into themselves by the transformations generating them. Just as the interval between two successive divisions of the old scale is called *unit* of distance or angle because *one* application of the generating transformation carries us over that interval, so for the same reason we name *unit* of distance or angle the magnitude extending from any division to the next in the new scale. Accordingly the distances or angles from the points or lines $z_1, \lambda z_1, \lambda^2 z_1, \lambda^3 z_1, \ldots$ to point or line z_1 are 0, 1, 2, 3, . . . respectively. By means of the new scale we can measure distances and angles whose magnitudes reckoned from z are expressible as whole numbers. In order to render the scale available for measuring distances and angles whose magnitudes are *any* rational numbers, we have merely to subdivide the scale intervals already obtained into n equal parts. This is done by applying $n-1$ times to the elements at the beginning of each interval, a transformation which repeated n times reproduces the transformation $z' = \lambda z$. The transformation required is therefore $z' = \lambda^{1/n} z$ where that one of the n roots of λ must be used that secures that the element $\lambda^{1/n} z$ shall fall between z and λz. We can then measure all distances or angles from z_1 to z where z is of the form $z = \lambda^{\alpha + \beta/n} z_1$, α and β being integers. The distance or angle from point or line $\lambda^{\alpha+\beta/n} z_1$ to z_1, is precisely $\alpha + \beta/n$.

If now we suppose the subdivision extended indefinitely and if we admit the notion of irrational number, then obviously we must regard the distance or angle from the point or line z_1 to the point or line $z \equiv \lambda^{\alpha} z$/as being expressed by a where a may be any positive real number whatever, whole or fractional, rational or irrational.

From the last equation we have $a = \log z/z_1 : \log \lambda$. Hence: *The distance or angle of a point or line z from the point or line z_1 is the logarithm of the ratio z/z_1 divided by the constant $\log \lambda$.*

The point or line z_1 was arbitrarily taken as initial element of our scale and our formula gives the distance or angle from z to any other point or line. The general linear transformation $z' = (az + b) : (cz + d)$ involves three parameters, two of which are determined by requiring the elements O_1 and O_2 to remain fixed. By means of the third parameter, the element z_1 may be brought to any desired position z' of range or pencil. Accordingly: *The distance or angle from point or line z to any other point or line z' is $\log z/z' : \log \lambda$, or $c \log z/z'$, where $c = 1 : \log \lambda$.*

It is readily seen that, as ought to be the case, the addition property of the old magnitude concept is preserved in the new concept just defined. That is to say, Distance (angle) zz_1 + distance (angle) $z_1 z'$ = Distance (angle) zz'; for $c \log z - c \log z_1 + c \log z_1 - c \log z' = c \log z - c \log z'$ identically. Also $c \log z/z = 0$, whence $c \log z/z' = -c \log z'/z$ conformably to the like property of the ordinary notion of measure. The displacement property, too, is preserved; for the scale-generating transformation $z' = \lambda z$ converts distance (angle) $z_r z_p$ into distance (angle) $\lambda z_r \lambda z_p$. These magnitudes are plainly equal, for the former is $c \log z_r - c \log z_p$ while the latter is $c \log \lambda + c \log z_r - c \log \lambda - c \log z_p$.

Geometric Meaning of the New Concept of Distance (Angle).— Let $z = z_1$ and $z = z_2$ be any two points (lines) of the range (pencil). The anharmonic ratio $(0\ z_1\ \infty\ z_2)$ of the pair (z_1, z_2) to the pair $(0, \infty)$ of fixed elements is

$$\lim_{y \doteq \infty} \frac{(0 - z_1)\ (y - z_2)}{(z_1 - y)\ (z_2 - 0)} = z_1/z_2$$

Hence the distance (angle) of two points (lines) is an arbitrary constant c times the logarithm of the anharmonic ratio of the two points (lines) to the two fixed — absolute — points (lines) of the range (pencil).

Introduction of Complex (Imaginary) Elements.— Hitherto only real elements have been admitted. We now extend the generalized concept of measurement to complex elements, points or lines, for which the co-ordinates z

and z' will be of the form $z=\alpha+\beta i, z'=\alpha'+\beta' i$, where $\alpha, \alpha', \beta, \beta'$ are real and $i=\sqrt{-1}$. Now $z = r\,e^{i\theta}$ and $z' = r'\,e^{i\theta'}$, whence $z : z' = (r : r')\,e^{i(\theta-\theta')} = \rho e^{i\phi}$. Hence distance (angle) $zz' = c \log z/z' = c \log \left(\rho e^{i\phi}\right) = c \log \left(\rho e^{i(\phi \mp 2n\pi)}\right) = c \log \left(\rho e^{i\phi}\right) \pm c \log e^{in2\pi} = c \log z/z' \pm 2icn\pi$, where n is an integer. It so appears that in the generic concept of measurement in hand distance (angle) is not a one-valued function but is an infinitely many-valued function, viz., a *periodic* function of period $2c\pi i$. The periodicity of the angle in the ordinary system of measurement is a special case of the preceding. Let ϕ be the angle between the lines $y=mx+b$ and $y=m'x+b'$; then $\tan\phi = (m-m') : (1+mm')$. As $\tan\phi = \tan(\phi \pm n\pi)$, we have $\tan(\phi \pm n\pi) = (m-m') : (1+mm')$, whence $\phi \pm n\pi = \tan^{-1}[(m-m') : (1+mm')]$; hence $\phi = \tan^{-1}[(m-m') : (1+mm')] \pm n\pi$.

Infinite Distances and Angles in the Generalized System of Measurement.— We will premise a brief account of the infinite elements in the ordinary system of measurement. For this system the scale-generating transformation for the range is $z'=z+c=(z+c) : (0z+1)$; for the pencil it is $z'=(z+\tan\gamma) : (1-z\tan\gamma)$. In the former case the fixed elements, given by $0z^2+0z+c=0$ are $z=\infty$ and $z=\infty$; i.e., the range's infinite (Desarguesian) point counted twice. (The symbol z is here taken to represent distance from a finite origin). In ordinary distance measurement, the range, or right line, contains two (coincident) points from which all other points are equally and infinitely (algebraically) distant — a fact of which the average carpenter is not aware. In this case the two points happen to coincide but what is here important to note is the fact that the point of coincidence is *double*. How stands the matter in case of ordinary angle measurement? The fixed elements (lines) are given by making $z'=z$, i.e., by the equation $\tan\gamma\, z^2+\tan\gamma = 0$, or $z^2=-1$, as $\tan\gamma \neq 0$. Hence the fixed (absolute) lines of the pencil make with the origin (initial or referee line) angles whose tangents are $+i$ and $-i$. Such lines are of course imaginary. Are the angles ∞ ? And does every other line (real) of the pencil make the same ∞ angle with these fixed lines? To answer, take any finite point for vertex of the pencil and choose this vertex for origin of Cartesian axes. Then the angle ϕ of any real line $y=mx$ of the pencil with the line $y=ix$ is given by $\tan\phi = (m-i) : (1+im) = 1 : i = -i$. Hence ϕ is independent of m, and hence all real lines are equi-inclined to the line $y=ix$. The same is true for line $y=-ix$. Hence as $y=mx$ rotates about the vertex of the pencil, it keeps a constant angle with each of two imaginary lines of the pencil. This fact suggests that $\tan^{-1} i$ and $\tan^{-1}(-i)$ are each infinite. That they are ∞ is readily established as follows: From Euler's equations $e^{iz} = \cos z + i \sin z$, $e^{-iz} = \cos z - i \sin z$, we have

$$\tan z = -i\,(e^{2zi}-1) : (e^{2zi}+1).$$

In the present case $\tan z = \pm i$, whence $z=\infty$.

The question arises: Has a range two points equidistant and infinitely distant from all its other points, and has a pencil two lines equi-inclined to and making an ∞ angle with all other lines of the pencil, in case of the generalized system of measurement? The answer is affirmative. In this case, the fixed elements of the scale-making transformation have been taken for origins O_1 and O_2. Their equations are $z=0$ and $z=\infty$. Now let z' be any point or line. The distance (angle) from $z \equiv z'$ to $z=0$ is $c \log (0 : z') = \infty$. In like manner, the distance (angle) from $z \equiv z'$ to $z=\infty$, being $c \log (\infty : z')$, *is* ∞. Hence *the distance (angle) between either of the absolute points (lines) of a range (pencil) and any other point (line) of the range (pencil) is infinite (logarithmically)*.

A Restriction Removed.— We will now abandon the supposition that the origins O_1 and O_2 coincide with the absolute elements. The absolute elements will, of course, be given by writing $z'=z$ in the transformation $z'=(az+b) : (cz+d)$; i.e., they are given by the equation $cz^2+(d-a)\,z-b=0$, or, as we may write it, changing the values of our constant letters, $az^2+2bz+c=0$; or, as $z=x_1 : x_2$, $\Omega\, xx \equiv ax_1^2+2bx_1x_2+cx_2^2=0$. Now let (x'_1, x'_2) and (x''_1, x''_2) be any two points (lines) of a range (pencil), then the quantities $(x'_1+\lambda x''_1,\ x'_2+\lambda x''_2)$ for varying λ are the co-ordinates of a variable point (line) of the range (pencil). This variable element will coincide with an absolute element for such and only such values of λ as satisfy the equation

$$a(x'_1+\lambda x''_1)^2+2b(x'_1+\lambda x''_1)(x'_2+\lambda x''_2)+c(x'_2+\lambda x''_2)^2=0,$$

or

$$\lambda^2\,\Omega x''x'' + 2\lambda\,\Omega x'x'' + \Omega x'x' = 0.$$

These values are

$$\lambda_1 = \frac{-\Omega x'x'' - \sqrt{\Omega^2 x'x'' - \Omega x'x'\,\Omega x''x''}}{\Omega x''x''},$$

$$\lambda_2 = \text{conjugate of } \lambda_1.$$

The anharmonic ratio of the element pair (x'_1, x'_2) and (x''_1, x''_2) to the pair of absolutes is $\lambda_1 : \lambda_2$. Hence, if we denote $x'_1 : x'_2$ by z' and $(x''_1 : x''_2)$ by z'', we have the proposition

Distance (angle) $z'z'' =$

$$c \log \left(\frac{\Omega x'x'' + \sqrt{\Omega^2 x'x'' - \Omega x'x'\,\Omega x''x''}}{\Omega x'x'' - \sqrt{\Omega^2 x'x'' - \Omega x'x'\,\Omega x''x''}} \right) \equiv c \log K.$$

Such is Klein's expression for the metric number of distance (angle) measured in accordance with the generalized system or scale. From it Cayley's expression is obtainable as follows: If n be any number, then $\log n = 2i \cos^{-1}(n+1 : 2\sqrt{n})$, a fact verifiable thus:

$$n = e^{i\,2\cos^{-1}\frac{n+1}{2\sqrt{n}}} = \cos\left(2\cos^{-1}\frac{n+1}{2\sqrt{n}}\right) + i \sin\left(2\cos^{-1}\frac{n+1}{2\sqrt{n}}\right) = \frac{(n+1)^2}{4n} - 1 + \frac{(n+1)^2}{4n} + i\left[2\frac{n+1}{2\sqrt{n}}\sqrt{1-\frac{(n+1)^2}{4n}}\right] = n.$$

Applying that fact to the Kleinian expression, we readily obtain

$$c \log K = 2ic \cos^{-1} \left[\Omega_{x'x''} / \sqrt{\Omega_{x'x'} \Omega_{x''x''}} \right]$$

whence, on letting $c = -i:2$, we obtain

$$\cos^{-1} \frac{\Omega_{x'x''}}{\sqrt{\Omega_{x'x'} \Omega_{x''x''}}}$$

which is Cayley's expression for distance (angle) of the elements $x' = x'_1 : x'_2$ and $x'' = x''_1 : x''_2$.

Application to Real Elements, Absolute Elements Distinct.— Two cases arise according as the absolute elements are *real* or are *imaginary*. Consider first the case where they are real. For the sake of convenience we shall first consider the range. Denote the absolute points by F_1 and F_2. Two points z and z' may be situated (1) both of them between, (2) neither of them between, or (3) only one of them between F_1 and F_2. In situations (1) and (2) the anharmonic ratio of the pairs (z, z') and (F_1, F_2) is *positive;* in the remaining situation, *negative*. Accordingly in the former case the logarithm of the anharmonic ratio is *imaginary*, while in the latter case, the logarithm is *real* except for the imaginary period before indicated. Hence in order that the distance between two points not separated by F_1 or F_2 shall be real, we must assign c for our distance function a *real* value. This being done, we have the theorem: *The absolute points being real and distinct, the distance between two real points z and z' is real or imaginary according as the points are not or are separated by one of the absolute points.* If, with Cayley, we assigned to c a pure imaginary value, viz.—$i/2$, then in the foregoing theorem we should have to interchange the words "real" and "imaginary" or else the phrase "not separated" and "separated." The Cayleyan choice is logically allowable. It is rejected as being inexpedient. It gives a generalized scale needlessly unlike the ordinary scale. For example, if 1, 2, 3 denote successive divisions of the Cayleyan scale such that the successive divisions shall be a *unit* apart, then, if division 1 falls between F_1 and F_2, division 2 must fall without, division 3 within, etc. Hence distance $\overline{13}$ regarded as the sum of $\overline{12}$ and $\overline{23}$ is 2 and is real but segment $\overline{13}$ measured *directly* is imaginary.

Accordingly in order that all distances between real points shall be real, it is necessary to confine ourselves to one of the two segments into which the line is separated by the absolute or infinite points, F_1 and F_2. Each of these segments is infinite in length, i.e., the distance from any point in either segment to either F is infinite, as before shown.

Let z be a point of either segment. Suppose the point to move in accordance with a transformation that leaves F_1 and F_2 unchanged. We may name *velocity of displacement* the ratio of the distance traversed to the time consumed. The distance is, of course, to be reckoned in the new way. If now we suppose the point to move with a constant velocity toward F_1 or F_2, it will approach nearer and nearer to F_1 or F_2 but will never reach either F_1 or F_2 since it would have to travel an infinite distance. If the point be supposed to be endowed with intelligence, it could never by any motion possible to it or by any experience assure itself of the existence of F_1 or F_2. If the point refused to assume the existence of F_1 and F_2, its geometry would so far forth be Euclidean in character. It could assume the existence of F_1 and F_2. It could still choose between the supposition that the F's were coincident and the supposition that they were distinct. The former supposition would bring its geometry into the category of Parabolic geometries, like our own Euclidean geometry, while the second supposition would lead to a so-called Hyperbolic theory, such as the geometry of Lobachevsky and Bolyai.

Imaginary Absolute Elements.— If the absolute elements are imaginary, let them be of the form $\alpha + \beta i$ and $\alpha - \beta i$. The anharmonic ratio of these to a pair (z, z') of real elements is imaginary of the form $e^{i\phi}$. Hence we have $c \log (z, \alpha + \beta i, z', \alpha - \beta i) = c(i\phi \pm 2ni\pi)$, which is pure imaginary or real according as c is taken to be real or pure imaginary. Hence in order that the distance between two real points may be real when the absolute points are conjugate imaginaries, it is necessary and sufficient to assign to c a pure imaginary value, say ic'. The absolute points being imaginary, the range contains no *real* infinite points, or points at ∞. Hence the range of straight line returns upon itself like a finite closed curve. The distance between any two of its points is periodic, of period $2\pi ic = 2\pi ii c' = -2\pi c'$. Hence in this system of measurement the length of the straight line is $2\pi c'$. It is this metric theory that characterizes the so-called Elliptic Geometry of Riemann and Helmholz. The measurement of segments of the straight line of this theory is analogous to the ordinary measurement of arcs of a circle of radius c'.

Extension to the Pencil.—The foregoing conclusions respecting the range are readily extensible to the pencil. If the two absolute lines F_1 and F_2 be real and distinct, the angle made with either of them by any other real line of the pencil is infinite and real. If any line rotate in accordance with any transformation leaving F_1 and F_2 unchanged, the line will move forever without reaching either F_1 or F_2—a fact that profoundly distinguishes this metric system from the ordinary one, for in the latter if a line rotate with any constant finite velocity, no matter how small, it will in course of a finite time return to its initial position. This possibility of thus returning is owing to the fact, already pointed out, that in ordinary angle measurement the pencil has no real lines at ∞ but, on the contrary, these lines are conjugate imaginaries, viz., the familiar so-called isotropic lines of the pencil. If the absolute lines be conjugate imaginaries other than the isotropic lines of ordinary geometry, the resulting theory of angular measurement is that which belongs to the Elliptic Geometry. In this case, as in that of the range, we must take c to be pure imaginary in order that the angle between two real lines shall be real. If we set $c = c'i$, the angle between two lines is periodic, of period $2\pi c'$, and the whole angle about the vertex will be $2\pi c'$. In ordinary geometry the whole angle is π; hence to pass from the elliptic theory of angle measurement to the ordinary system, we

must let $c'=\frac{1}{2}$, or $c=+i:2$. This done, the general expression for the angle between two lines (x'_1, x'_2) and (x''_1, x''_2) becomes

$$\cos^{-1}\left[\Omega_{x'x''}/\sqrt{\Omega_{x'x'}\ \Omega_{x''x''}}\right],$$

where, as the absolute lines are to be the usual isotropic lines, we are to take $\Omega_{xx}=x_1^2+x_2^2$, and thence $\Omega_{x'x'}=x'^2_1+x'^2_2$, $\Omega_{x''x''}=x''^2_1+x''^2_2$, and $\Omega_{x'x''}=x'_1x''_1+x'_2x''_2$ whence the expression for angle becomes

$$\cos^{-1}\frac{x'_1x''_1+x'_2x''_2}{\sqrt{(x'^2_1+x'^2_2)\ (x''^2_1+x''^2_2)}}$$

and this, as should be the case, is the familiar expression for the angle between two lines $x'_1x+x'_2y=0$, $x''_1x+x''_2y=0$. We have thus the theorem: *in the ordinary Euclidean geometry, the angle between two lines is ½ times the logarithm of the anharmonic ratio of the given pair of lines to the pair of isotropic lines through their common point.* This definition is due to Laguerre. (Consult *Nouvelles annales de Mathématique*, 1859). If the lines are perpendicular, i.e., have slopes m and $-1/m$ respectively, then the anharmonic ratio in question is

$$\left(m, i, -\frac{1}{m}, -i\right)=-(m-i)\left(i-\frac{1}{m}\right)/\left(i+\frac{1}{m}\right)(i+m)=-1;$$

hence we have in ordinary Euclidean geometry the following definition of perpendicularity: *Two lines are perpendicular when and only when they are harmonic to the isotropic lines through their common point.*

Absolute Elements Coincident.— We turn now to the case where the absolute elements are coincident. The anharmonic ratio of the pair (z_1, z_2) to the pair (z_3, z_4), being $(z_1-z_3)\ (z_2-z_4)\ /\ (z_2-z_3)\ (z_1-z_4)$, is equal to 1, if the elements of a pair, as (z_1, z_2), coincide. Hence if $z_1\equiv z_2$ be the absolute elements, the distance (angle) $z_3\ z_4=c\log 1=0$, if c be finite. The same fact appears from the distance (angle) expression

$$2\,i\,c\,\cos^{-1}\left\{\Omega_{x'x''}/\sqrt{\Omega_{x'x'}\,\Omega_{x''x''}}\right\}$$

where $\Omega_{xx}\equiv a\,x_1^2+2\,b\,x_1x_2+c\,x_2^2$; for, if the absolute elements are coincident, then (and only then) $\Delta\equiv b^2-a\,c=0$, and $\Omega_{xx}\equiv(p_1x_1+p_2x_2)^2$; whence the distance (angle) expression becomes

$$2\,i\,c\cos^{-1}\frac{(p_1x'_1+p_2x'_2)\ (p_1x''_1+p_2x''_2)}{\sqrt{(p_1x'_1+p_2x'_2)^2\ (p_1x''_1+p_2x''_2)^2}}$$

$$=2\,i\,c\cos^{-1}=0,\ \text{if } c \text{ be finite.}$$

In order to study the metric determination in case of coincident absolute elements, we must view the case as a limiting one, i.e., we must suppose the absolute elements to differ by an infinitesimal and then examine the law according to which the distance (angle) expression approaches zero as the absolute elements approach coincidence. To this end observe that $\Omega_{x'x'}\Omega_{x''x''}-\Omega^2_{x'x''}=(x'_1x''_2-x'_2x''_1)^2\Delta$. Now

$$2\,i\,c\cos^{-1}\frac{\Omega_{x'x''}}{\sqrt{\Omega_{x'x'}\,\Omega_{x''x''}}}=$$

$$2\,i\,c\sin^{-1}\frac{(x'_1x''_2-x'_2x''_1)\sqrt{\Delta}}{\sqrt{\Omega_{x'x'}\Omega_{x''x''}}},$$

a new expression for distance (angle), admitting immediate application of the relation *lim* $(\sin a:a)=1$ as a approaches zero. As the absolute elements approach coincidence, Δ approaches zero, and hence the sine (in the above expression) approaches zero; so that we may replace the sine by its $\sin^{-1}$. We thus get for distance (angle)

$$2\,i\,c\,\sqrt{\Delta}\frac{x'_1x''_2-x'_2x''_1}{\sqrt{(\ )\ (\ )}}$$

$$=k\,\frac{x_1'x_2''-x_2'x_1''}{(p_1x'_1+p_2x'_2)\ (p_1x''_1+p_2x''_2)}$$

where we choose c so that $k\neq 0$ as Δ approaches zero. The last expression gives us the distance (angle) of two elements (x'_1, x'_2), (x''_1, x''_2) when the absolute elements $(p_1x_1+p_2x_2)^2=0$ coincide. Consider the expression $E\equiv(q_1x'_1+q_2x'_2)\ /\ (p_1x'_1+p_2x'_2)-(q_1x''_1+q_2x''_2)\ /\ (p_1x''_1+p_2x''_2)$. It is readily seen that $E=k\ (x'_1x''_2-x'_2x''_1)\ /\ (p_1x'_2+p_2x'_1)\ (p_1x''_1+p_2x''_2)$, provided we make such obviously possible choice of the q's that $q_1p_2-q_2p_1=k$. The form E shows that the addition property of distance (angle) is valid also when the absolute elements are coincident. For let three elements be (x'_1, x'_2), (x''_1, x''_2), (x'''_1, x'''_2). Substituting in E, it readily appears that distance (angle) between elements one and two + distance (angle) between two and three = distance (angle) between one and three. Also distance (angle) between (x_1, x_2) and itself is $(q_1x_1+q_2x_2)\ /\ (p_1x_1+p_2x_2)-(q_1x_1+q_2x_2)\ /\ (p_1x_1+p_2x_2)=0$. As to the displacement property, it readily appears that E is the *difference of two anharmonic ratios*, for the form $(q_1x_1+q_2x_2)\ /\ (p_1x_1+p_2x_2)$ is the anharmonic ratio of the elements $q_1x_1+q_2x_2=0$ (or $z_1=-q_2/q_1$), $p_1x_1+p_2x_2=0$ (or $z_2=-p_2/p_1$), $(p_1-q_1)x_1+(p_2-q_2)x_2=0$ } or $z_3=-(p_2-q_2)/(p_1-q_1)$ }, and $z_4=x_1/x_2$. Now as linear transformation leaves anharmonic ratios invariant, the quantity E will remain unchanged, i.e., the displacement property is preserved also when the absolute elements fall together.

General Metric Determination in the Plane.— We have hitherto attached the generalized concept of measurement to one-dimensional spaces: the range and the pencil. It is easy to carry the concept into spaces of two dimensions, namely, the plane regarded as an ensemble of points (pencils) and of lines (ranges). The pair of absolute elements (of range, pencil) has for analogues in the plane the conic viewed on the one hand as locus and on the other as envelope. Accordingly the Ab-

solute—the configuration of reference for metric determination—in case of the plane will be some chosen conic C. Any line L will cut C in two points, real and distinct, or imaginary, or coincident. These two points will serve for absolute points in case of the range having L as base. Reciprocally, any pencil V of the plane has two lines tangent to C. These tangents, which of course may be real and distinct, or imaginary, or coincident, will be the absolute lines for metric determination in the pencil V.

We may represent C in homogeneous coordinates by $S_{xx} \equiv ax_1^2 + bx_2^2 + cx_3^2 + 2dx_1x_2 + 2ex_1x_3 + 2fx_2x_3 = 0$. Let $S_{x'x'}$ denote the result of replacing in S_{xx} x' for x and let $S_{xx'} \equiv ax_1x'_1 + bx_2x'_2 + cx_3x'_3 + d(x_1x'_2 + x_2x'_1) + e(x_1x'_3 + x_3x'_1) + f(x_2x'_3 + x_3x'_2)$. Any two points x_i and x'_i $(i = 1, 2, 3)$ determine a range. This cuts C in two points. The anharmonic ratio of this pair and the given pair is

$$\frac{S_{xx'} + \sqrt{S^2xx' - S_{xx}\ S_{x'x'}}}{S_{xx'} - \sqrt{S^2xx' - S_{xx}\ S_{x'x'}}} = R$$

hence the distance between the points is $c \log R$, or $2ic\cos^{-1}\{S_{xx'} / \sqrt{S_{xx}\ S_{x'x'}}\}$ where c is a fixed arbitrary constant, the same for all ranges of the plane.

Reciprocally, if $\Sigma_{\xi\xi} = 0$ be the line equation of the Absolute, the angle between two lines ξ_i and ξ'_i $(i = 1, 2, 3)$ is

$$c' \log \frac{\Sigma_{\xi\xi'} + \sqrt{\Sigma^2\xi\xi' - \Sigma_{\xi\xi}\ \Sigma_{\xi'\xi'}}}{\Sigma_{\xi\xi'} - \sqrt{\Sigma^2\xi\xi' - \Sigma_{\xi\xi}\ \Sigma_{\xi'\xi'}}} \text{ or}$$

$$2ic' \cos^{-1}\left\{\Sigma_{\xi\xi'} : \sqrt{\Sigma_{\xi\xi}\ \Sigma_{\xi'\xi'}}\right\}$$

where, again, c' is an arbitrarily chosen constant, the same for all pencils of the plane.

The significance of the generalized concept in hand may be exemplified by a problem. Let it be required to find the locus of a point x_i that so moves as to be always a given distance from a fixed point x'_i. The distance depends only on the cosine; we may, therefore, obtain the required equation by setting it equal to a constant k. On clearing of fractions and the radical, the equation is $S^2xx' = k^2 S_{xx}\, S_{x'x'}$ which, being of second degree in the x_i, represents a conic section. This conic contains the four points common to the double line $S^2xx' = 0$ and the absolute $S_{xx} = 0$. Now the line $S_{xx'} = 0$ is the polar of the point x'_i as to the absolute. Hence the conic $S^2xx' = k^2 S_{xx'} S_{xx}$ is tangent to the absolute at the points where it is cut by the line $S_{xx'} = 0$. We have thus the theorem: *The locus of all points x_i equidistant from a fixed point x'_i is a conic tangent to the absolute at the points where the absolute is cut by the polar of the fixed point.*

Pouring new wine into old bottles, we may call the locus in question a (generalized) *circle*. Its centre is the point x'_i and its radius is $2ic\cos^{-1}k$. Regarding k as a parameter, the equation $S^2xx' = k^2 S_{x'x'} S_{xx}$ represents the family of concentric circles about x'_i as centre. They are all tangent to the absolute at the same contact points. The circle corresponding to $k = 0$ is degenerate, being the polar (counted twice) of the centre x'_i. Its radius $= 2c\, i \cos^{-1} = \pi ci$. If $k = 1$, the radius is $2ic\cos^{-1} 1 = 0$, and the circle, $S^2xx' - S_{xx'} S_{xx} = 0$, is the pair of tangents from the circle centre to the absolute. (Compare the isotropic lines of ordinary Euclidean geometry). The distance between any two points on either of these lines is zero, for the point of contact is the double fixed element (the absolute points) for metric determination in the range in question. To render such distance non-zero, we should have to take $c = \infty$, and then the distance of any two points not on a tangent to the absolute would be ∞. Finally suppose $k = \infty$; the radius $= 2ic\cos^{-1}\infty = \infty$, and the circle is $S_{xx} = 0$, the absolute itself. Hence: *The absolute is the locus of all points infinitely and equally distant from any point whatever not on the absolute,* just as the infinite line of the ordinary projective plane is the locus of points infinitely and equally distant from all finite points of the plane. The reader may readily solve and discuss the solution of the reciprocal of the foregoing problem. The reciprocal problem is: To find the envelope of a line ξ_i that moves so as to make always the same angle with a given line ξ'_i.

Displacements of the Plane.—There being ∞^8 collineations of the plane, and a conic depending on five essential constants, it is seen that a conic can be transformed into itself by ∞^3 collineations of the plane. By such a transformation any point P of the conic is converted into a point P' of the conic. P and P' are in general different points; but any transformation converting a conic into itself converts at most two of its points each into itself. Suppose a transformation t converts the absolute into itself and that P and P' are the two points of C that are unchanged in position. Then t converts into themselves the tangent at P, the tangent at P' and the point Q common to the two tangents. That is, t not only leaves C unchanged but also the triangle, P, P', Q. Query: How many of the ∞^3 collineations leaving C unchanged leave also unchanged the particular triangle in question? Taking this triangle for triangle of reference, the equation of C is $x_1x_2 - x_3^2 = 0$. The most general collineation that leaves fixed the sides of the triangle is that defined by the equations: $x_1 = a_1x'_1$, $x_2 = a_2x'_2$, $x_3 = a_3x'_3$. This transformation converts C into $a_1a_2x'^2_1 - a_3^2x'^2_3 = 0$. This is identical with C when and only when $a_1a_2 - a_3^2 = 0$, i.e., when the ratios, $a_1 : a_3$, $a_2 : a_3$, are subject to one condition. Hence the answer to the query is a simple infinity of collineations. All these transformations convert into itself the quantity x_1x_2 / x_3^2. Hence they convert into itself each conic of the pencil $x_1x_2 - kx_3^2 = 0$ of conics. This pencil consists of all the conics tangent to C at the points where it is cut by $x_3 = 0$, the polar line of the point common to $x_1 = 0$ and $x_2 = 0$.

The collineations in question fall into two classes according as $a_3 = +\sqrt{a_1 a_2}$ or $a_3 = -\sqrt{a_1 a_2}$. The first class constitute a group, or closed system; i.e., combination of two of them is always one of the class. Thus the transformation $x_1 = a_1 x'_1$, $x_2 = a_2 x'_2$, $x_3 = +\sqrt{a_1 a_2} x'_3$ followed by the transformation $x'_1 = \beta_1 x''_1$ $x'_2 = \beta_2 x''_2$, $x'_3 = +\sqrt{\beta_1 \beta_2} x''_3$ is equivalent to the transformation $x_1 = a_1 \beta_1 x''_1$, $x_2 = a_2 \beta_2 x''_2$, $x_3 = +\sqrt{a_1 a_2 \beta_1 \beta_2} x''_3$, of the same class; while if the negative sign be used in the component transformations, the resultant contains $x_3 = +\sqrt{a_1 a_2 \beta_1 \beta_2} x''_3$ hence the second class closed, is not a group. Geometrically the two classes are distinguished by the fact that the transformations of the first class convert into itself each of the segments of C into which C is separated by the contact points of $x_1 = 0$ and $x_2 = 0$, while the transformations of the second class exchange these segments. To the collineations of the first class Klein has given the name displacements of the plane for the reason that they correspond to the collineations — called displacements — that in the ordinary Euclidean plane leave the line at ∞ unchanged. The second class correspond to collineations in the ordinary theory that convert figures into inversely congruent figures.

We have, therefore, the proposition: The group of displacements leave fixed not only the absolute C but also all the conics (circles in this theory) tangent to C at the two fixed points. The equation of these circles is $x_1 x_2 - k x_3^2 = 0$. Through any point $x'i$ there passes in general one and but one of these circles, viz., that whose equation is $x'^2_3 x_1 x_2 - x'_1 x'_2 x_3^2 = 0$. A displacement of the plane causes each point to move on that circle on which it chances to lie. Accordingly each displacement is a rotation of the plane about a fixed point, all other points describing concentric circles (generalized) about this point. Those displacements in which the centre of rotation is at ∞ are specially noteworthy. To be at ∞ the centre must be on C. Hence the circles of motion have 4-point contact with C at their common centre. In the ordinary, or parabolic, geometry the centre would be on the line at ∞ and the circles would have their centre at ∞, i.e., they would be a system of parallel lines. Motion along these is translation. Hence translation in ordinary (parabolic) geometry corresponds to those displacements (in the generalized doctrine) where the centre of rotation is on the absolute conic C.

Distances (Angles) Invariant under Displacements.— Let xi and $x'i$ be any two points and let their range cut C in ui and $u'i$. The anharmonic ratio of these points is unchanged by collineation. Now a displacement converts ui and u' into points vi and $v'i$ of C, and xi and $x'i$ pass into yi and $y'i$ collinear with vi and $v'i$. Hence distance between x and $x'i$ = distance between yi and $y'i$. Similar argument shows that angles are unchanged by displacements. Neither are distances and angles changed in size by the non-group class of collineations not changing C.

Generalized Measurement for Sheaf of Lines or Planes.— The line geometry of the sheaf is analogous to the point geometry of the plane, and the plane geometry of the sheaf is quite parallel to the line geometry of the plane. The four theories may be studied simultaneously by means of the same algebraic machinery. In order to transfer the generalized metric of the plane to the sheaf, we take for absolute in the latter a cone of second order (class) having the carrier point P of the sheaf for vertex. The angle of two lines L and L' of the sheaf will be an arbitrary constant c times the logarithm of the anharmonic ratio of these lines and the pair of lines common to the absolute and the plane (pencil) of L and L'. Reciprocally, the angle of two planes π and π' is an arbitrary constant c times the logarithm of the anharmonic ratio of these planes and the two planes tangent to the absolute cone and containing the common line of π and π'. Developments in case of the sheaf quite similar to those found for the plane are obviously obtainable in similar manner and need not be further pursued.

The Elliptic and Hyperbolic Theories of the Plane.— Returning to the plane, it is obvious that two theories will arise according as the absolute C is real or is imaginary. If C be imaginary, the two absolute points of every real range (line) will be conjugate imaginaries. These being the infinite points of the range, this will have no infinite real points. The line will be finite in length, the length depending on the value assigned to c. No pencil will have real tangents to C. No two real lines will intersect on C, i.e., at ∞, hence no two real lines can be parallel. The resulting theory is the so-called Elliptic geometry of the plane. If our plane really is elliptic instead of being, as we commonly assume, Euclidian (or parabolic) then the infinite region of it is an imaginary conic section.

If C be supposed to be real, the resulting theory accords with that of Lobachevski and Bolyai. It is that called Hyperbolic by Klein. The real points now fall into two classes; the class E of points such that from each two real tangents can be drawn to the absolute; and the class I such that no real tangents proceed from its points to the absolute. These classes may be respectively described as exterior and interior. Similarly real lines compose two classes: those that cut C in two real points, and those that cut it in imaginary points. Suppose, as we must make a choice, we confine ourselves to the class I and to the lines that go through the points of I. No pencil has real lines at ∞, i.e., no real tangents to the absolute. The absolute lines of any pencil are imaginary (like the isotropic lines of ordinary projective geometry). Hence, as before indicated, we take $c' = ic'_1$, pure imaginary. The sum of the angles of any pencil is, therefore, $2c'_1\pi$. On the other hand, every real straight line has two points at ∞, namely, the points where it cuts the absolute. Accordingly we regard c as a real quantity. Owing to our choice of c and c' the angle of any two lines intersecting within the absolute is real, and real also is the distance between any two points of I. But two lines having points in I but not intersecting within the absolute make an imaginary angle with each other; and the distance between two points, one in I and the other in E, is imaginary. The distance from

any point to the absolute is infinite. The angle of two lines intersecting on the absolute is zero. Such lines are parallel.

Suppose we are situated at some point P of I. Suppose further that we are capable of only such motions as are furnished by displacements, transformations, that is, that leave the absolute unchanged. Just as in ordinary geometry, so here, since the total angle about P is finite, a finite time would suffice to make a complete rotation about P by turning at any finite rate, however small. Again, just as in ordinary geometry, so here we could travel on any straight line in either direction (sense) at any finite velocity however great, without, in any finite time, however great, reaching, much less passing, the absolute conic C. The dwellers within C could not escape from the region I by any combination of displacements. For those inhabitants their plane, the region I, is strictly limited by the absolute. By no experience possible to them could they assure themselves that C existed, or, C being granted, that there is a region on beyond, outside of C. If we set $c'_1 = \frac{1}{2}$, then the geometry within I becomes a detailed picture of the Lobachevskian, or hyperbolic, geometry so far as concerns the plane. For example, one of the L. propositions is that through any point of the plane two lines can be drawn parallel to a given line. This proposition is matched or pictured by the fact that through any point of I two and but two lines can be drawn meeting any line within C where the line cuts C. These two lines are parallel to the third line, meeting it at its infinite points. Another L. proposition is that as a point recedes from a line, the angle of the two parallels through the point to the line increases and approaches the value π as the distance becomes infinite. The like holds within C, for when the point common to the parallels is a point of C, the parallels to the given line become parallel to each other, one of their angles being zero and the other π. Again, the sum of the angle of a triangle within C is less than π and decreases as the triangle increases, becoming zero when the vertices are infinitely apart, i.e., are on C: a fact agreeing with the L. geometry. Once more, in the L. geometry, two lines perpendicular to a third do not intersect. Now two lines within C, to be perpendicular to a third line within C, must belong to the pencil vertexed at the pole of the third line. But this pole is outside of C. Hence the perpendicular, as regarded by geometers within C, do not intersect, for, as we have seen, the region E does not exist for such geometers. They might indeed posit such a region but then it would have only *ideal* as distinguished from intuitional or experiential existence. Still again, in the L. geometry we have the proposition that a circle of infinite radius is not a straight line. Now, in theory of the region I, any circle of infinite radius and infinite centre is, as before shown, the absolute itself and so not a straight line. If the radius be kept ∞ and the centre be taken on C, then the circle is again not a straight line but a conic having 4-point contact with C. Is it, then, impossible to conceive a straight line of the region I as a circle? It is, unless the line be regarded as a circle having its centre in E, at the ideal pole of the given line. In such case the radius would be imaginary.

Special Metric in the Plane.— To obtain this we take for absolute C a degenerate conic which regarded as a locus is a pair of coincident straight lines and which regarded as an envelope is a pair of points (pencils) of the line. It is easy to see how a proper conic can degenerate into a conic of the sort described. Thus let $b^2x^2 + a^2y^2 = a^2b^2$ be an ellipse. Call its vertices $A\ (a, o)$ and $A'\ (-a, o)$. For all values of m the line $y = mx \pm \sqrt{m^2a^2 + b^2}$ is tangent to the ellipse. Now let b approach zero. The ellipse degenerates (as a locus) into the double line $y = 0$, and (as an envelope) into the points A and A' enveloped by $y = m\ (x \pm a)$ as m ranges through the ensemble of real numbers. Such a degraded conic being taken for absolute C, every pencil of the plane will contain two distinct absolute lines, or lines at ∞, viz., those that pass through A and A'. These absolute lines will be real or imaginary according as A and A' are real or imaginary. Accordingly the special metric so far as angles are concerned is analogous to the general metric. Not so, however, in case of distances. For the absolute points of any range are coincident, namely, the two points common to the range and the double line AA'. To render the distance between two points non-zero, it is necessary to take c infinite, and then, in agreement with ordinary (parabolic) geometry, the distance becomes an algebraic instead of a transcendental function of the co-ordinates. The distance between two points of a range containing A or A' is zero, for such a range is tangent to the absolute. Similarly the angle of any two lines intersecting on AA' is zero: such lines are parallel. Every conic through A and A' is to be called a circle, and two circles tangent to each other at A and A' are to be regarded as concentric circles. In every system of concentric circles there is one of infinite radius, namely, the double line AA', which is, accordingly, the locus of points at ∞. Here, as in ordinary geometry, the principle of duality fails. For example, the envelope of a line making a constant angle with a given line is not a proper conic but a point.

The special (parabolic) geometry here indicated may be derived from ordinary projective geometry, when the double line AA' becomes the locus (counted twice) of the Desarguesian points of the plane and the points A and A' become the circular points at ∞.

Generalized Metric in Space.—The absolute will naturally be a surface S of second order (and class). The distance between two points is an arbitrary constant c times the logarithm of the anharmonic ratio of the given pair of points and the pair of (absolute) points cut from S by the line joining the given points. Reciprocally, the angle of two planes is an arbitrarily chosen constant c' times the anharmonic ratio of the two planes to the pair of (absolute) planes, i.e., the two planes containing the line common to the given planes and tangent to S.

There are ∞^9 collineations of space that convert S into itself. These fall into two classes according as they do not or do exchange the two systems of generatices of S. The collineations of the first class — called *displacements*

— constitute a closed system, or group. The second class is not a group.

The locus of a point at a given distance from a fixed point is a second order surface — generalized *sphere* — tangent to S along the conic cut from S by the polar plane of the given point, the sphere centre. S itself is a sphere, viz., the locus of all points at ∞, of all points, that is, that, in the metric system in hand, are infinitely distant from any point not on S.

If S is imaginary, all lines are of finite length. The sum of the angles of an axial pencil of planes is finite. This general theory passes into the Elliptic geometry if we set $c = i/2$, the sum of the angles of an axial pencil being then π.

If S is real (and not ruled), the geometry of the interior of S includes *the* Hyperbolic geometry as a special case, namely, when $c = i/2$.

The special metric that arises on taking S to be a degenerate surface passes over into ordinary Euclidean geometry when the degenerate S is (as locus) the locus (counted twice) of the Desarguesian points of space and (as envelope) is the imaginary circle at infinity. See GEOMETRY, NON-EUCLIDEAN; GEOMETRY, PROJECTIVE.

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CASSIUS J. KEYSER,
Adrain Professor of Mathematics, Columbia University.

ANALYZER, the portion of a polariscope (q.v.) employed in the examination of polarized light. Nicol prisms, tourmaline plates, double-refracting crystals and movable mirrors are each used for this purpose.

ANAM, or **ANNAM**, an Asiatic country on the east side of the Indo-Chinese Peninsula, along the China Sea, about 850 miles long, with a breadth varying from over 400 miles in the north to 100 in the middle. It is composed of Tonquin or Tongking in the north and Cochin-China and Chiampa in the south. The area is 52,100 square miles, and the population (1913) 4,702,446.

Its coast is much indented, affording many fine harbors, and a mountain range extends its entire length. The Mehong, the principal river, is the boundary between Anam and Siam and is navigated by steamboats. The capital and largest city is Hué. Rice, cinnamon, sugarcane, coffee, tea, tobacco, the areca nut, mulberry, betel, manioc, bamboo, caoutchouc, cardamons, dye, medicinal plants and cotton are the chief productions, though silk is manufactured to some extent and fine woods are exported. Iron, copper, zinc and gold are found. The mines are worked by natives. Coal mines are situated at Nongson. Cattle-rearing is becoming important; in 1916 there were 215,000 head of cattle in the country. The chief imports are cotton-yarn, cottons, tea, petroleum, paper goods and tobacco; chief exports are sugar, rice, cotton and silk tissues and paper. The government is a monarchy, the king being nominally assisted by a council of six, but French influence predominates. The King Than Thai, who succeeded to the throne in 1889, abdicated in accordance with the wishes of the French government, in favor of his second son, Duy-Tan, b. 1900, who is under the control of a Council of Regency. The ports of Tourane, Qui-Nhon and Xuan-Day are open to European commerce and the customs revenue conceded to France. French troops occupy part of the citadel of Hué, the capital (Pop. 60,611). Bin-Dinh, the largest town, has 74,400 inhabitants. Anamite functionaries, under the control of the French government, administer all the internal affairs of Anam.

The inhabitants are from two races, the Mountain Mois and the Anamese proper, and generally under the middle size and less robust than the surrounding peoples. Their language is monosyllabic and is connected with the Chinese. The religion of the majority is Buddhism, but the educated classes hold the doctrines of Confucius; besides which there are 420,000 Roman Catholics. Anam was conquered by the Chinese in 214 B.C., but in 1428 A.D. completely won its independence. The French began to interfere actively in its affairs in 1847 on the plea of protecting the native Christians. By the treaties of 1862 and 1867 they obtained the southern and most productive part of Cochin-

China, subsequently known as French Cochin-China; and in 1874 they obtained large powers over Tonquin. By the treaty of 1884, ratified at Hué, 1886, Anam was declared a French protectorate. Consult Barral, 'La Colonisation française au Tonkin et en Annam' (Paris 1899); Dumontier, 'Les symboles chez les Annamites' (ib. 1890); Fourneseau, 'Le Siam ancien' (ib. 1895); Hannah, 'Brief History of Eastern Asia' (New York 1900); Jammes, 'Au pays annamite' (Paris 1898); Leraye, 'L'Empire d'Annam et le peuple annamite' (1899); Norman, 'Peoples and Politics of the Far East' (London 1895); Patté, P., 'Hinterland Moï' (Paris 1906).

ANAMORPHISM. See METAMORPHISM.

ANAMORPHOSIS, a term applied to a drawing so executed as to present a distorted image of the object represented, but which, if viewed from a certain point, or reflected by a curved mirror or through a polyhedron, shows the object in true proportion.

ANANIAS, a member of the Church at Jerusalem, struck dead with his wife Sapphira because of an attempt to misrepresent the amount of their gifts to the Apostle Peter. The name was also borne by a Damascus disciple named in connection with Saul's adventure there and by a high-priest in Jerusalem belonging to the Sanhedrim.

ANANTAPUR, India, a town and district in the Madras presidency. The town has a station on the Madras Railway, 62 miles south-east from Bellary. Pop. about 8,000. The district was constituted in 1882 out of the unwieldy district of Bellary. It has an area of 5,557 square miles and in its northern and central portions is a high plateau, generally undulating, with large granite rocks or low hill ranges rising here and there above its surface. In the southern portion of the district the surface is more hilly, the plateau there rising to 2,600 feet above the sea. There is a remarkable fortress rock at Gooty, 2,171 feet above the sea, and a similar but larger rock at Penukonda, with an elevation equal to that of Bangalore, about 3,100 feet. Gooty fortress was a stronghold of the Mahrattas, but was taken from them by Hyder Ali. In 1789 it was ceded by Tippoo to the nizam, and in 1800 the nizam ceded the district to the British in payment for a subsidiary British force. The principal crops are millet, rice, other food grains, pulse, oil seeds and cotton. There are several steam factories for pressing cotton. Pop. about 790,000.

ANAPA, ą-nä'pą, a seaport town of Russia, situated on the Black Sea. It has been variously the possession of Turks and Russians, but has belonged to Russia from 1829. Pop. about 7,000.

ANAPÆST, in prosody, a foot consisting of two short syllables and one long one. In the comedies of Aristophanes it was the dominant measure, and Greek choruses employed it in their exits and entrances. From this latter circumstance it was frequently styled the marching rhythm.

ANAPHRODISIACS, ăn-ăf'ro-dīz'ī-ăks, are remedies that are supposed to diminish sexual power or desire. They may act directly on the vegetative genital synapses in the spinal cord, indirectly through the circulation on the brain, or peripherally on the sense organs. Inasmuch as local irritation is a frequent cause of stimulation of the genital sense, attention to cleanliness is imperative and the removal of all sources of irritation indicated. Local analgesic applications, such as weak solutions of carbolic acid — 1 to 2 per cent — or oxide of zinc ointment with carbolic acid, are useful. Of the general anaphrodisiacs the bromides are the best. Bromide of sodium or potassium are most frequently employed. Special medical advice is needed in the treatment of persistent genital excitement.

ANAPHYLAXIS, an exaggerated susceptibility on the part of certain individuals to certain chemical substances, chiefly proteids, which may either be taken into the stomach, such as mussels, crab meat, strawberries, etc., breathed, such as various hay fever and asthmatic reactions to various plant pollens, or which may be injected into the body, such as horse serum. Richet, a French physiologist, first studied it extensively in connection with mussel poisoning, although the studies of Jenner on smallpox and cowpox were really studies of this phenomena, as well as those of Magendie in 1839, Behring in 1901, but Richet first gave the name. When such substances, to which the individual is susceptible, are brought into contact with the body, they produce their sudden reaction: in some instances with a skin urticaria (hives), skin rashes, eruptions; at other times swelling of the joints, or of the mucous membranes, such as in some hay fevers, some asthmas; again with nausea, vomiting and profuse diarrhœas (often incorrectly called ptomaine poisoning).

The causes for these anaphylactic reactions are extremely complicated and not yet thoroughly elucidated. They are not pure chemical phenomena, but are mediated by the vegetative nervous system, and are more striking in a certain group of individuals who are termed vagotonic (q.v.). Consult Hackett, 'Reference Handbook of Medical Sciences' (Vol. I, 1913).

ANAPT'OMOR'PHUS, a fossil lemur from the Eocene of Wyoming, allied to the modern tarsier. Some authorities have considered this animal as related to the ancestral line of man.

ANARCHISM, a theory of social organization, numbering, it is said, about 1,000,000 adherents. Its doctrines represent the extreme of individualism. It looks upon all law and government as invasive, the twin sources whence flow nearly all the evils existent in society. It therefore advocates the abolition of all government as we to-day understand the term, save that originating in voluntary co-operation. Anarchists do not conceive of a society without order, but of an order arising out of the law of association, preferably through self-governing groups, for it may be said that, with here and there an exception, anarchists regard mankind as gregarious. "Our object is to live without government and without law," said Elisée Reclus, the eminent geographer, and in his day the leading anarchist of France. Anarchists do not ignore the enormous economies resulting from the law of association, but insist that the law will be better served in a state of freedom and in the absence

of all compulsion. They believe that everything now done by the state can be better done by voluntary or associative effort, and that no restraint upon conduct is necessary, because of the natural tendency of mankind in a state of freedom to respect the rights of the individual. The repression of crime, where crime might arise, could safely be left to spontaneously created organizations, such as the Vigilance Committees in early California, where no State government existed. In the view of Prince Kropotkin, the leading Russian anarchist, no cause for litigation would arise after we had abolished "the present system of class privilege and unjust distribution of the wealth produced by labor, that creates and fosters crime."

To quote further from Kropotkin: "We are nurtured from our birth to believe that we *must* have government. Yet the history of man proves the contrary. When small bodies or parts of humanity broke down the powers of their rulers and resumed some part of their foreordained freedom, these were always epochs of the greatest progress, economically and intellectually. In the direct ratio to the freedom of the individual he advances."

Early attempts at mutualism were those of W. Thompson in England and J. Warren in the United States. In 1827, Warren opened a "Time store" in Cincinnati, where labor was exchanged hour for hour in different kinds of goods.

It is not easy to sum up in a few paragraphs the leading doctrines of any economic sect and at the same time retain absolute accuracy of statement. It should therefore be said that anarchists, while agreeing that the doctrine of *laissez faire* should be extended to all departments of human activity, are by no means in agreement on all points. There are evolutionary and revolutionary anarchists, and communist- and individualist-anarchists. The point on which all are agreed is in their opposition to compulsory forms of government, and in regarding the necessary despotism of majorities in a democracy as only a little less hateful than the despotism of a monarchy. "Governments are the scourage of God," says Proudhon, with whom the philosophy of modern anarchism may be said to have begun.

Pierre Joseph Proudhon was born in Besançon, France, in 1809, and died in 1865. Germs of the doctrine of which he is the founder may be traced to much earlier, even ancient periods. Among his modern precursors is William Godwin (b. in Wisbech, England, 1756; d. in London, 1834), who is better known as the author of the novel, 'Caleb Williams,' but who in his 'Inquiry Concerning Political Justice,' which appeared in 1793, advocated the abolition of every form of government, and formulated the theory of anarchistic communism. But modern anarchism as a force in sociologic thought began with the publication of Proudhon's famous essay, 'What is Property' (1840). In it he rejects all law and authority, but in a work which appeared in 1852 entitled, 'The Federative Principle,' he seems to have modified in a measure his former theory of government and favors the formation of self-governing communities. In the former work occurs the phrase which is destined to be forever associated with the name of Proudhon, but which was uttered by the Girondist Brissot a half century earlier, "Property is robbery."

It was upon the notion that he had furnished a demonstration of this thesis that Proudhon especially prided himself. But this phrase as used by the father of anarchism must be held to apply rather to modern methods of acquisition than to property itself, for Proudhon was an individualist, not a communist-anarchist, and strove, however unsuccessful he was in making himself understood, rather to refine than to destroy the idea of property. In all his reasoning on this point there is much dialectic subtlety, of which, with perverted ingenuity, Proudhon was overfond; but it may be said that what he really sought was the overthrow of all prevailing theories of property with a view to rendering it unassailable from the standpoint of exact equality and social justice. His chief American follower was Benjamin R. Tucker, who started a journal *Liberty*, in 1881, and combined Spencerianism with the views of his master. In Germany Proudhon found adherents in Hess and Grün, who showed a strong Hegelian influence. The doctrines of anarchism in the hands of Michael Bakunin underwent a change from the advocacy of a purely peaceful revolution to one of force. Bakunin was born in 1814, died 1876. He was prominent in the Paris Revolution of 1848, was surrendered to Russia and sent to Siberia, but succeeded in making his escape. His principal work, in addition to innumerable pamphlets and addresses, is 'Dieu et l'État.'

"The propaganda by action," as it is termed, by which it was hoped to inspire such dread and horror as to compel the adoption of measures of social amelioration, or perhaps the overthrow of the state itself, has borne abundant fruit in the attempted assassination of Emperor William in 1878, in the attempt upon the life of the German princes in 1883, in the assassination of President Carnot, of France, in 1894, of the Empress Elizabeth, of Austria, in 1898, of King Humbert, of Italy, in 1900, and of President McKinley, by Czolgosz, in the autumn of 1901. Other anarchist crimes were the throwing of a bomb in the French Chamber of Deputies, in 1893, by Vaillant, the bomb explosion in Paris, caused by Emile Henry, in 1894, the attempt by Lipsich on the (then) Prince of Wales at Brussels in 1900, the attempt on the lives of the King and Queen of Spain on their wedding day in 1906, and the murder of King George of Greece on 18 March 1913. See also SABOTAGE; SYNDICALISM; FERRER, FRANCISCO.

The Haymarket tragedy of 1886, in Chicago, by which a number lost their lives in an explosion from a bomb thrown by some unknown hand, and which resulted in the trial and conviction of seven professed teachers of anarchism in that city, four to the gallows, two to life imprisonment and one to a term of 15 years, aroused the attention of the whole civilized world. It is now seen, after the lapse of 17 years, that these men, even if dangerous to the community, were convicted more largely by the existing state of public terror than by any actual evidence connecting them with the throwing of the bomb. The fact that the pardon of the three who escaped the gallows was petitioned for, after the terror of the time had

died away, by some of the most prominent citizens of Chicago, is proof of the change the public mind underwent regarding the accused. The controversy over the justice of their conviction is still unsettled. With these acts of murder and vengeance the purely economic doctrines of anarchism have of course no relation. "The propaganda of action" is repudiated by those who are sometimes termed "philosophical anarchists," to distinguish them from the revolutionary wing. This latter school regards force as fundamentally at war with their ideals. It does not believe that the social revolution can be accomplished by the methods of Bakunin and his school. Proudhon never preached force.

With the policy of "propaganda by action" in this country is linked the name of Johann Most, a former member of the German Reichstag; in France, that of Charles Malato ("I love and admire Vaillant just as some English Republicans love and admire Cromwell, who was also a regicide"—Charles Malato); and in Italy, that of Enrico Malatesta, an anarchist, like Kropotkin, of noble family. ("It seems to me that in the natural order of evolution violence has as much a place as the eruption of a volcano. All great progress has been paid for by streams of blood. I cannot see how the present conditions based upon force can be changed in any other way than by force, and so long as they use force against us we must in self-defense employ violent methods."—Enrico Malatesta).

As Proudhon was the father of anarchistic individualism, Kropotkin is as indisputably the father of anarchistic communism. Theoretic anarchism for some time subsequent to the advent of its French founder was rigidly individualistic. Max Stirner, a follower of Proudhon in Germany, whose philosophy was more of a blank negation than that of his master, pushed the ego to a point where it more resembles a caricature than a dogma, and Bakunin hated the idea of communism. But in Kropotkin it must be said that the idea of property has reached its disappearing point, and the ideal of anarchism is at the last purely communistic. Kropotkin's life and his romantic career, united with the vast store of knowledge he possesses, give to his professions of anarchism a fascination and a weight. Communistic anarchism is essentially the doctrine of Tolstoy, who combines it with religious motives.

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ANASTASIA, ăn-ăs-tā'shi-ą, **Saint,** the name of three Christian martyrs. (1) A virgin said to have been a pupil of Saints Peter and Paul, and slain under Nero (54–68 A.D.). She is commemorated April 15. (2) "The Younger," martyred under Diocletian, 304, wife of one Publius, a pagan, who himself laid an information against her. Two alleged letters of hers in prison have been preserved. The Greeks commemorate her the 22d of December, the Latins the 25th. (3) A Greek maiden of Constantinople, whom Justinian (about 597) sought as a mistress. To escape him she fled to Alexandria and lived there disguised as a monk for 28 years. She is commemorated 10 March.

ANASTASIUS, ăn-ăs-tā shi'ŭs, the name of four Popes, the first and most eminent of whom held that office 399–401. He was a strong opponent of Origen. Anastasius II succeeded Gelagius I in 496; d. 498. Anastasius III filled the papal chair 911–13. Anastasius IV was Pope 1153–54.

ANASTASIUS I, an emperor of the East who succeeded Zeno, A.D. 491: b. about 430; d. 518. He distinguished himself by suppressing the combats between men and wild beasts in the arena, abolishing the sale of offices and building the fortifications of Constantinople. His support of the heretical Eutychians led to a dangerous rebellion and his anathematization by the Pope.

ANASTASIUS II, an emperor of the East who was raised to the throne in 713. Attempting various reforms, he was deposed in 716 and became a monk at Thessalonica.

ANASTASIUS, a romance by Thomas Hope (1819). The author was known to have written some learned books on furnishing and costume; but 'Anastasius' gave him rank as an accomplished painter of scenery and delineator of manners. Anastasius, the hero, a young Greek ruined by injudicious indulgence, is haled before a Turkish magistrate. Discharged, he fights on the side of the Crescent and goes to Constantinople, where he resorts to all sorts of shifts for a livelihood—jugglery, peddling, nostrum-making; becomes a Mussulman, visits Egypt, Arabia, Sicily and Italy, and finally dies young, a worn-out and worthless adventurer. The book has passages of great power, often of brilliancy and wit; but belongs to the fashion of a more leisurely day and is now seldom read.

ANASTATIC PRINTING, a process by which a facsimile of a page of type or an engraving, old or new, is reproduced in the manner of a lithograph or page of letterpress. The print or page to be transferred is dipped in diluted nitric acid, and, while retaining a portion of the moisture, laid face downward on a polished zinc plate and passed through a roller-press. The zinc is immediately corroded by the acid contained in the paper, excepting on those parts occupied by the ink of the type or engraving. The ink, while rejecting the acid, is loosened by it and deposits a thin film on the zinc, thus protecting it from the action of the acid. The result is that those parts are left slightly raised in relief, and the plate being then washed with a weak solution of gum, and otherwise treated like a lithograph, the raised parts, being greasy, readily receive ink from the roller and give off a facsimile impression of the original.

ANAS'TOMO'SIS, in anatomy the joining of the branches of a vessel with other vessels of the same or a different branch. Anastomoses are found in the arteries, veins and lymphatics. Anastomoses of nerve and muscle fibres are also spoken of.

ANATASE, a mineral more correctly known as OCTAHEDRITE (q.v.).

ANATH, ā'năth, is the name of a goddess worshipped in Palestine, as apparently appears from the name of a city mentioned in Joshua and Judges — Beth-Anath, meaning the house of Anath. Anathoth, which may be the plural, is mentioned in the prophecy of Isaiah. A. H. Sayce thinks it is a Chaldean deity worshipped by the Canaanites. The name Anath is said to be found on Egyptian monuments of the 18th dynasty. Anathoth was the home of Jeremiah the prophet.

ANATHEMA, a word used in a form of excommunication from the Church. It is properly a Greek word, and was originally applied to an object set apart and devoted to a deity, such as a gift hung up in a temple (being derived from the Greek *anatithēmi,* I lay up); but it gradually came to mean separation from God and men, something accursed; and latterly to pronounce an anathema, to anathematize, became much the same as to curse. *Anathema* occurs repeatedly in New Testament Greek, in the English version being generally rendered "accursed," but once the original word is retained (1 Cor. xvi, 22) along with *maranatha,* the latter serving apparently to intensify the curse, though it is properly a Syriac expression signifying "the Lord will come." The Greek and Roman Catholic Churches both make use of the anathema. In the latter it can be pronounced only by a Pope, council or some of the superior clergy. The subject of the anathema is thus declared an outcast from the Church. When councils declare any belief heretical the declaration is couched in the following form: *Si quis dixerit,* etc., *anathema sit,* "If anyone says (so and so) let him be anathema." The anathema was thus pronounced by the Vatican Council against opponents of the doctrine of papal infallibility. In the Middle Ages the anathema was freely used. See EXCOMMUNICATION.

ANATHEMA. Andreyev's five-act drama 'Anathema,' published in 1909, betrays the effect made upon him by the book of Job. In the prologue as well as in the epilogue the Devil, who is throughout named "Anathema," the Accursed One, appears before the eternal dual Arbitrator who guards the entrance "beyond the iron Gates," and boasts of his coming conquest of David Leizer, "a sick and foolish old Jew whom no one knows" and who seems forgotten even of God. The five acts of the play show David given over like Job to the machinations of Anathema, who, finding him in the midst of sordid poverty, brings to him as if from his brother, dead in America, a fortune of 2,000,000 rubles. At the desire of his ambitious wife, David hires a palace; his beautiful daughter Rose tries to make the most of her attractions; his son Naum, dying of consumption, takes dancing-lessons. David is unhappy and resolves to give away all his possessions. He commands Anathema, who, under the name of Nullius, has stayed with him as his adviser, to summon all the poor and unfortunate to share in his worldly goods. The great fortune is utterly inadequate to meet such demands. The sick and the blind come to him for cure; those that have lost loved ones demand a miracle of him. He tries to escape; they follow him into the wilderness, and, when they find he can do nothing for them, they stone him to death. Anathema exults and again appears before the dread guardian of the Beyond to boast of his victory, but is told that "David has attained immortality and lives forever in the deathlessness of light which is life." Anathema refuses to believe such a tale and goes away, still blaspheming the name of Truth. There is nothing of Faust in David Leizer. He is unchanged by his new riches. Anathema is a cringing Mephistopheles who leads his victim on to apparent destruction by seeming to meet all his benevolent desires. The purely realistic scenes of the work are full of humor and pathos. These passages are practicable on the stage, but as a whole it is rather a closet-drama than one adapted for the modern stage. It was translated into English by Herman Bernstein and published in New York in 1910.

NATHAN HASKELL DOLE.

ANATHOTH, a town in Palestine, assigned to the Levites, the birthplace of the prophet Jeremiah and the home of Abiathar the high-priest. It was about three miles northeast of Jerusalem, and the small village of Anata occupies its site.

ANATIDÆ, the family of birds that includes the fresh-water ducks (q.v.). The typical genus is *Anas,* represented by the mallard.

ANATOL. Arthur Schnitzler, past-master of the Viennese drama, opened his career as playwright in 1893 with 'Anatol,' a series of seven scenes from the life of a sentimental philanderer. Anatol is a fashionable worldling who seeks relief from society in the companionship of this or that pretty child of the people. Each scene exhibits some phase of an affair with a different charmer. Now he hesitates to ask his Cora, who lies hypnotized, whether she has been faithful, lest his illusion be dispelled. Now he confesses to a woman of his own class his joy in his humble mistress of the moment, a girl who lacks beauty, elegance and wit, but from whom emanates the soft lure of a spring evening and the spirit of love itself. Now Anatol grows almost tearful as he meditates upon the romance of a by-gone hour and all he must have meant to little Bianca, who presently reappears, unable even to recall him. Now he rages against his Emilie, not because she has had another lover, but because she would keep, for its price alone, the black diamond he had given her. Now he tenders a farewell supper to a ballet dancer, dreading to break to her the news that he has found a fairer friend, but only to learn that Annie has replaced him by an artist of the chorus. Again he chafes to hear his inamorata citing against him her husband's tastes and preferences; and now on his marriage morning he finds himself embarrassed to dispose of Ilona, who has frolicked with him the night before and little dreams that he is to leave her. Thus sentiment

mingles with cynicism, melancholy with humor, in scenes which, despite their sensual implications, are delicate and refined. Technically, 'Anatol' is of interest as substituting for a dramatic story a series of impressionistic pictures linked but loosely by an art deriving less from the stage than from fiction. Schnitzler's dialogue is delightful, quick to respond to every shift of emotion, suggestive, restrained, and evincing the finest literary tact. For English readers and playgoers, the piece has been pleasantly paraphrased by Granville Barker as 'The Affairs of Anatol' (1911).

FRANK W. CHANDLER,
Dean College of Liberal Arts, University of Cincinnati.

ANATOLI, ă'nă-tō'lē, **Jacob,** Hebrew scholar: b. 1194; d. 1256. He was invited to Naples by the enlightened ruler, Frederick II, and under this royal patronage and in association with Michael Scot, made Arabic learning accessible to western readers. Among his most important services were translations of works bv Averroes.

ANATOLIA, the modern name of Asia Minor. See ASIA MINOR.

ANATOMY, literally a cutting up; but anatomy usually signifies the special study of the structure of organic bodies, morphology (q.v.) and applies to both animals and plants. Animal morphology is the study of human or other animal forms, the study of the relationship between the forms constituting Comparative Anatomy (q.v.). The study of the minute or microscopical anatomy is termed Histology (q.v.). Developmental Anatomy is the study of the gradual growth of the animal, Embryology (q.v.). In the plant world there are also the correlated branches of Plant Morphology, Comparative Anatomy, Histology and Embryology. The study of the microscopical structure of the single cell is termed Cytology; of collections of related cells and tissues constituting organs, Organology; thus the study of the bony system is termed Osteology, of the structures of circulation Angiology, of nerve structures Neurology, of the muscles Myology, of the viscera Splanchnology, etc. Each in its turn has its special departments of investigation.

The study of anatomy may be approached from the purely descriptive side, Descriptive Anatomy, or may deal with the anatomy of related organs in related animals, as Systematic Anatomy. Applied or Practical Anatomy, or that branch dealing with its study as an aid in the diagnosis and treatment of disease, may be designated as Medical or Surgical Anatomy. Regional and Topographical Anatomy deals with the study of special parts or the special relations to surrounding parts.

History.— The beginnings of human knowledge of the structure of organic bodies are preserved from the earliest times in fragments only, but there are very good reasons for believing that much more was known many thousands of years before the Christian era than there is written evidence to substantiate. The history of anatomical study is correlative with the history of medicine, and even in very early times inquiries were made concerning the structure of the human and animal body.

It is usual to ascribe to the Greeks the first foundations of anatomical knowledge, but it seems that Chinese culture, which was highly developed when the peoples of Europe were in a very primeval condition, had a well systematized medical lore that included much exact pharmacological knowledge, with some few anatomical facts, although the anatomy of the early Chinese was largely speculative. Section of the human as well as lower animal bodies was forbidden by at least two of the religious sects of early Chinese culture, the Alman and Buddha worships. It is interesting to note that as early as 2838–2699 B.C., Shinnong was a half-mythical medicine man in China, and it is said that Chinese works on medicine were written as early as 2698–2599 B.C. (Hwang Ai).

In India the sacred work of the Ayur Veda, supposed to date from between the 14th to the 9th centuries B.C., at least 100 years before the cult of Æsculapius had begun, contains descriptions of the human body obtained from dissections, and it has been maintained that Charaka and Susrutu, the earliest of Indian physicians, should be considered the earliest anatomists. Inasmuch as the probable dates of these Indian worthies is much more recent than was formerly supposed (100 A.D.), little can be made of these claims. At all events their anatomy was much cruder than that of the Hippocratic school circa 400 B.C. Egypt contributed somewhat to the knowledge of anatomy, and the Papyrus Ebers, 1553? B.C., is a monument of old Egyptian medicine. It is of interest to note that some of the Hippocratic nomenclature of anatomy is of Egyptian origin. The influence of religion, however, was very strong in the shaping of Egyptian medicine. Evisceration was largely practised and undoubtedly led to the collection of many anatomical facts, the importance of which has become lost to students. It is certain, however, that the school of medicine situated in Greece, on the island of Cos, laid the firm foundations of our knowledge of anatomy. It was in Greece also that the physician's profession was amply recognized. This early Hippocratic age gave rise to a professional conscience, and the "Physician's Oath," or the "Hippocratic Oath," "is a monument of the highest rank in the history of civilization" (Gomperz: 'Greek Thinkers').

There were at least seven physicians with the name of Hippocrates who taught in the early times. Hippocrates II (430 B.C.), however, was the great Hippocrates, but the knowledge of anatomy then possessed must be considered as the accumulation of the school rather than the work of any one man, for, as has already been pointed out, some of the Hippocratic nomenclature is Egyptian in origin (v. Oefele). Inasmuch as the Hippocratic writings are partly preserved, a better idea of the anatomical knowledge of the times may be gathered from them than from the mythical, traditional, and fragmentary remnants left by other peoples. The school of Cos had a fairly accurate and extensive knowledge of the human skeleton, and they knew the general shapes and varieties of most of the internal organs. Their physiological hypotheses, however, were crude but suggestive.

From the time of the great Hippocrates the school of Cos seemed to deteriorate, although Polybus, the son-in-law of Hippocrates II, Syennesis, Diogenes and Praxagoras, the last named being noted for his anatomical knowledge, kept alive many of the traditions of the

school. With Aristotle (384–323 B.C.) there came a period of more exact science and the dissection of the lower animals was practised, hence Aristotle may be termed the father of Comparative Anatomy. His researches in anatomy were wide and deep and his work on animals contains much that is still taught.

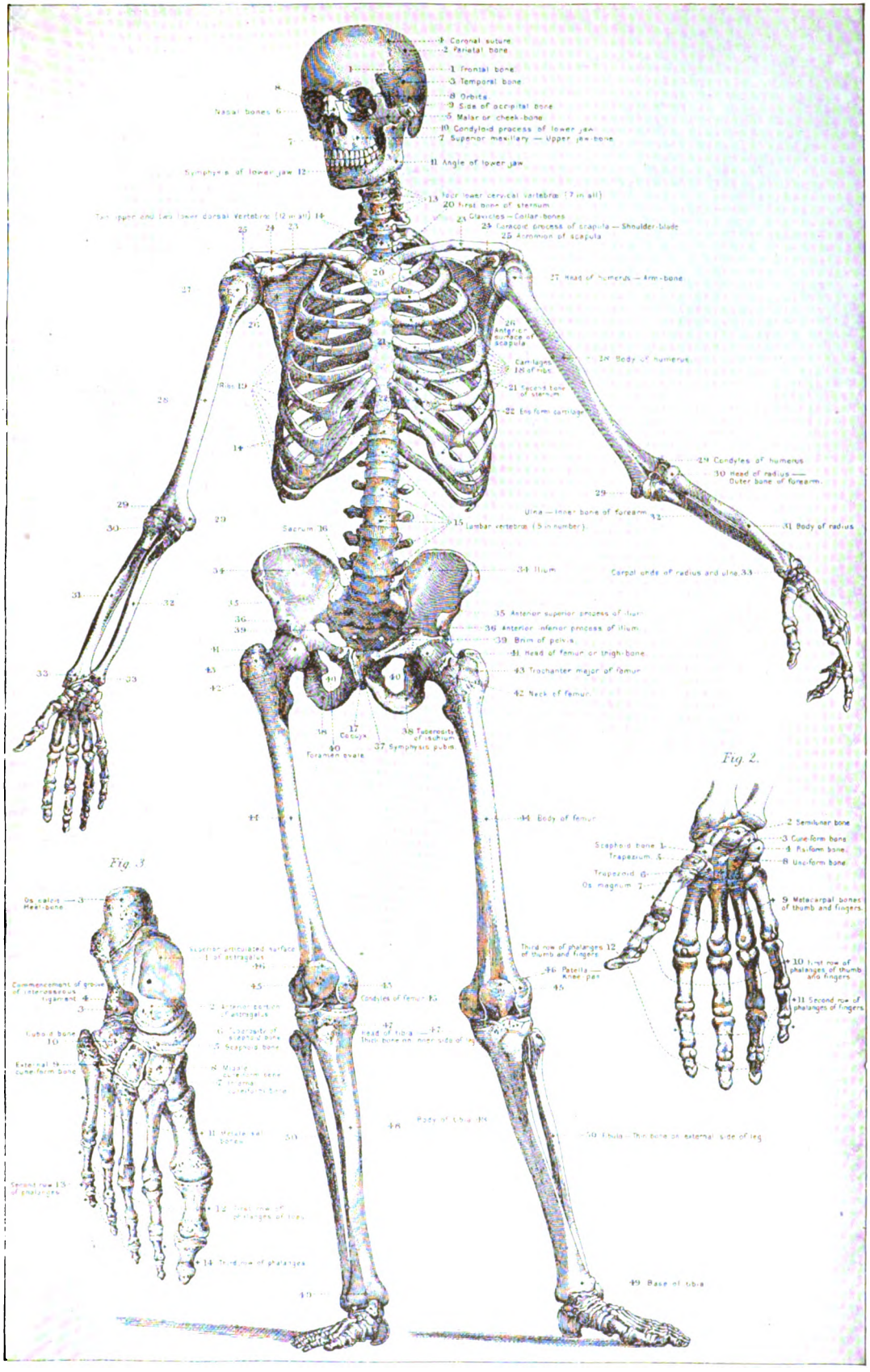
The Alexandrian period, 300 B.C., during which the culture of Rome and of Greece was encouraged in Egypt under the Ptolemies, shows as a bright spot in the history of anatomical science. With the foundation of the Alexandrian Museum, the analogue of a modern university, the practice of human dissection became authorized. This period was a brilliant one in the history of medicine. Herophilus and Erasistratus were among the early leaders, the former making some noteworthy contributions to the knowledge of the anatomy of the brain. He maintained that it was the organ of thought and the origin of motion. He also described the lacteals and the lymphatics, and was an indefatigable searcher for the seat of the soul, which he placed in the floor of the fourth ventricle of the brain, the place now known to be the site of the cranial nerves, that are indispensable for the function of breathing. Herophilus also is credited with the destruction of the old doctrine that the arteries held air, hitherto the veins only having been thought to contain blood.

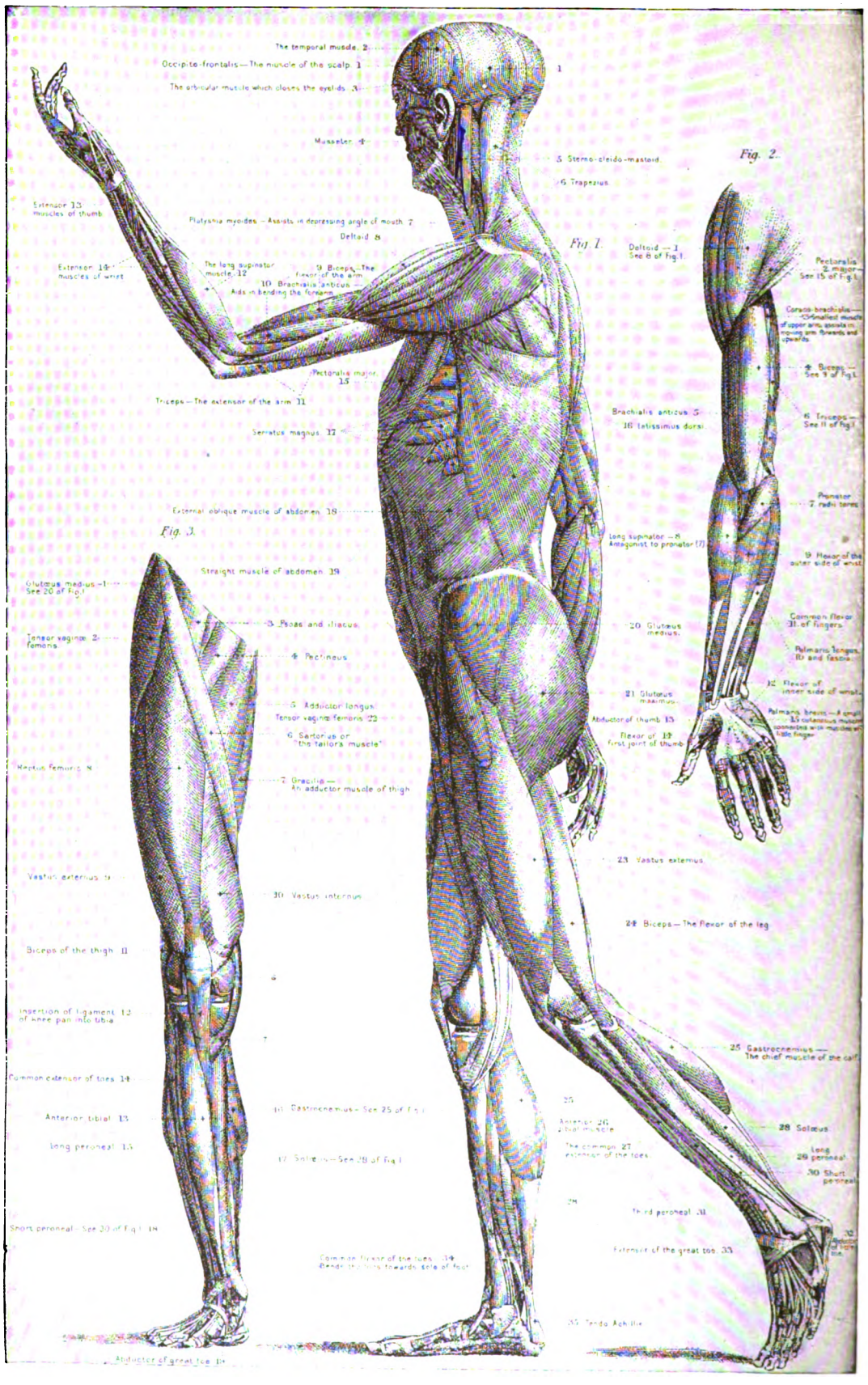
Erasistratus first described the valves in the veins, made the general subdivision of sensory and motor nerves, and drew the generalization of the relation of the complexity of the brain convolutions and mental development. He also first suggested the thought of anastomoses between the arteries and veins. Many others followed, but the rise of the Empirical school (q.v.) was the forerunner of the gradual decay of the Alexandrian school. It was to the newly arisen empire of Rome that the stream had turned, and until the time of Cato Greek physicians flourished in Rome. Asclepiades (126–56 B.C.) was one of the founders of the Atomic school at Rome, and Rufus (97 B.C.) of Ephesus, with A. Cornelius Celsus (25 B.C.–40 A.D.) were among those who have left definite anatomical landmarks. Celsus is known as a brilliant man, a compiler of the work of his predecessors. His anatomical work was insignificant, but he contributed largely to therapeutics. The last dying ember of this Alexandrian transplanted school showed in Claudius Galen, a Greek from Pergamos, a town already noted for its Æsculapian temple. Galen was a man of great brilliancy, an independent thinker, and it was to his literary efforts that much of the history and treatment of the Hippocratic school has been preserved to us. His works on anatomy alone were at least 15 in number, nine of which are preserved. Galen systematized much of the anatomical knowledge of the time, and although much of his data was drawn from the study of apes it was to pass muster in the service of human anatomy. He was perhaps the first to make any experimental physiological studies. His descriptions of the relations of the brain to the spinal cord and his knowledge of the cranial nerves were in advance of his predecessors. Galen's work stands out as the last systematic work of the Greek period, and following his death began the dark era of the barbaric inroads of the northern races and the dispersal of the culture of the East.

For a period of many centuries history is comparatively silent on the subject of medicine. No great schools arose, yet the doctrines of the ancient Greeks were kept alive in many places by obscure scholars and by many peoples, although it is known that the Saracens were largely instrumental in keeping intact that which Galen had handed down, without adding much, however, to his teachings. A flourishing intellectual development took place in the Byzantine countries, and many universities were founded by the Arabs, where the Roman–Hellenic culture was mingled with the Christian–Oriental ideas to found a new culture. Among the most famous of the Oriental physicians was Sergios von Resaina (536). He translated both Galen and Hippocrates into Syrian. Oreibasios was also a commentator of the Greeks; Avicenna (980–1036) was the Galen of the Orientals. This period of medical history has been called the Arabic period, and not until the influence of the crusades commenced to make itself felt did the period of the Renaissance begin.

The history of medicine (anatomy) now becomes more and more multiplex; new schools begin to be founded. Salerno, Naples, Montpelier, Venice, Bologna, Prague, Vienna and Oxford successively built universities and attracted the ablest minds in medicine. Scholars traveled from university to university to learn from a professor here and a professor there, and the fortunes of the universities rose and fell like the tides of the sea. In 1224 it is said that the University of Bologna alone had 10,000 students. Among the early names of this period of transition may be mentioned Lisfranc (1295); Mondino (1275–1327), who wrote the first anatomy since the time of Galen, and which reached 25 editions—he also suffered persecutions for his zeal in dissecting; Linacre (1461–1524), of England, was one of the earliest scholars to bring the results of the new awakening to Oxford and to Cambridge; and Sylvius, or Jacques Dubois, a Frenchman, was another of these great early anatomists of the reconstruction period. Sylvius first arranged all of the muscles of the human body and gave them the names which, for the most part, they now carry.

Andreas Vesalius (1514–64), a Belgian, first studied at Louvain, and later became a pupil of Sylvius at Paris. At the age of 22 he became professor of anatomy at Padua, and at 29 issued a monumental work on anatomy, the best that had been given up to that time. He corrected many of Galen's errors and had a checkered career. General gross anatomy under Vesalius, who was a son, grandson and great-grandson of a physician, began to assume more definite shape. In his student days at Paris under Sylvius, anatomy was taught upon the animal cadaver. Sylvius, however, was an uncompromising Galenist, and, although he made dissections, he followed Galen's treatises in very servile fashion. He was practically the last of his school, and his doctrines were swept away by the light thrown by this indefatigable seeker after truth as drawn from nature rather than from books. "My study of anatomy," said


4 Coronal suture
2 Parietal bone
1 Frontal bone
3 Temporal bone
8 Orbits
9 Side of occipital bone
6 Malar or cheek-bone
10 Condyloid process of lower jaw
7 Superior maxillary — Upper jaw-bone
Nasal bones 5
11 Angle of lower jaw
Symphysis of lower jaw 12
13 Four lower cervical vertebræ (7 in all)
20 First bone of sternum
Two upper and two lower dorsal vertebræ (12 in all) 14
24 Clavicles — Collar-bones
23 Coracoid process of scapula — Shoulder-blade
25 Acromion of scapula
27 Head of humerus — Arm-bone
26 Anterior surface of scapula
Cartilages of ribs
24 Body of humerus
Ribs 19
21 Second bone of sternum
22 Ensiform cartilage
24 Condyles of humerus
30 Head of radius — Outer bone of forearm
Ulna — Inner bone of forearm 32
31 Body of radius
15 Lumbar vertebræ (5 in number)
Sacrum 16
34 Ilium
Carpal ends of radius and ulna 33
35 Anterior superior process of ilium
36 Anterior inferior process of ilium
39 Brim of pelvis
41 Head of femur or thigh-bone
43 Trochanter major of femur
42 Neck of femur
18 Coccyx
38 Tuberosity of ischium
40 Foramen ovale
37 Symphysis pubis
44 Body of femur
Fig. 2.
2 Semilunar bone
3 Cuneiform bone
4 Pisiform bone
8 Unciform bone
Scaphoid bone 1
Trapezium 5
Trapezoid 6
Os magnum 7
9 Metacarpal bones of thumb and fingers
Third row of phalanges 12 of thumb and fingers
10 First row of phalanges of thumb and fingers
46 Patella — Knee-pan
45
11 Second row of phalanges of fingers
Fig. 3.
Os calcis — 3 Heel-bone
Commencement of groove of interosseous ligament 4
Cuboid bone 10
External wedge-form bone
Second row 13 of phalanges
45
Condyles of femur 45
47
Head of tibia — 47 Thick bone on inner side of leg
48 Body of tibia 48
50 Fibula — Thin bone on external side of leg
49 Base of tibia


The temporal muscle. 2
Occipito-frontalis — The muscle of the scalp. 1
The orbicular muscle which closes the eyelids. 3
Masseter. 4
Extensor 13 muscles of thumb
Platysma myoides — Assists in depressing angle of mouth. 7
Deltoid. 8
Extensor 14 muscles of wrist
The long supinator muscle. 12
9 Biceps — The flexor of the arm
10 Brachialis anticus — Aids in bending the forearm
Pectoralis major. 15
Triceps — The extensor of the arm. 11
Serratus magnus. 17
External oblique muscle of abdomen. 18
Fig. 3.
Straight muscle of abdomen. 19
Gluteus medius — See 20 of Fig. 1
3 Psoas and iliacus
Tensor vaginæ femoris. 2
4 Pectineus
5 Adductor longus
Tensor vaginæ femoris. 23
6 Sartorius or "the tailors muscle"
Rectus femoris. 8
7 Gracilis — An adductor muscle of thigh
Vastus externus. 9
30 Vastus internus
Biceps of the thigh. 11
Insertion of ligament 12 of knee pan into tibia
Common extensor of toes. 14
Anterior tibial. 13
Long peroneal. 15
Short peroneal — See 30 of Fig. 1. 16
16 Gastrocnemius — See 25 of Fig. 1
17 Soleus — See 28 of Fig. 1
Common flexor of the toes. 34
Bends its toes towards sole of foot
Abductor of great toe. 36
Fig. 1.
1
5 Sterno-cleido-mastoid.
6 Trapezius.
Deltoid — 1 See 8 of Fig. 1.
Fig. 2.
Pectoralis 2 major — See 15 of Fig. 1.
Coraco-brachialis — Smallest muscle of upper arm, assists in moving arm forwards and upwards.
Biceps — See 9 of Fig. 1.
16 Triceps — See 11 of Fig. 1.
Brachialis anticus. 5
16 latissimus dorsi
Pronator 7 radii teres
Long supinator — 8 Antagonist to pronator (?)
9 Flexor of the outer side of wrist.
Common flexor 31 of fingers.
Palmaris longus. 10 and fascia.
12 Flexor of inner side of wrist.
Palmaris brevis — A small 33 cutaneous muscle connecting wrist muscles with little finger.
20 Glutæus medius.
21 Glutæus maximus.
Abductor of thumb 35
Flexor of 19 first joint of thumb
23 Vastus externus.
24 Biceps — The flexor of the leg.
25 Gastrocnemius — The chief muscle of the calf.
26 Anterior tibial muscle
28 Soleus
The common 27 extensor of the toes
Long 29 peroneal
30 Short peroneal
31 Third peroneal
Extensor of the great toe. 33
35 Tendo Achillis

he, "would never have succeeded had I, when working at medicine at Paris, been willing that the viscera should be merely shown to me and to my fellow students at one or another public dissection by wholly unskilled barbers, and that in the most superficial way. I had to put my own hand to the business." Human dissection was rapidly and superficially practised, but Vesalius is known to have haunted cemeteries and gibbets to obtain human material. The results of his studies were published in 1543 in his masterpiece, 'De Humani Corporis Fabricâ. Libri VII,' the first of a long series of more distinct modern treaties on physiology as well as anatomy. Vesalius may truly be said to have been the founder of modern biological science. "He brought into anatomy the new spirit of the time, the young men of the time who listened to the new voice."

Of the contemporaries of Vesalius many were almost as famous as he. Eustachius at Rome, and Fallopius at Paris, Ferrara and Padua corrected many of Vesalius's details, and Eustachius may be said to have been the first to call attention to the study of embryology as an aid in the interpretation of gross anatomy. Both Eustachius and Fallopius made noteworthy additions to the knowledge of the ear. These were the days of enthusiasm in the discovery of new facts, and so great was the striving for the new culture that it is said that criminals were utilized for purposes of experiment and dissection, probably after smothering. A large coterie of brilliant men lived at this time. Servetus (1509–53), a Spaniard, first made out many of the true facts of the pulmonary circulation. Cæsalpinus (1517–1603), a highly cultured scholar and a great botanist, was among the first to speak of the circulation of the blood. Varolius (1543–75) furthered the knowledge of the anatomy of the nervous system. Spigelius (1578–1625) made noteworthy studies of the liver. Realdo Colombo (1494–1559), who succeeded Vesalius at Padua, and was subsequently professor of anatomy at Pisa, filled out the outline of Servetus. Some authorities claim that he stole the ideas and correctly described the pulmonary circulation, although he did not appreciate the corollaries of his discovery. He imitated Vesalius and his work in a bold reproduction of his friend's studies; and Fabricius (1537–1619), who succeeded Fallopius at Padua, built a special anatomical amphitheatre where he taught anatomy to England's great anatomist Harvey.

The time had now come for a mind who could take this accumulating mass of anatomical facts, which after all were extensions in detail only of the old Hippocratic anatomy, and to discover new physiological principles, for it was noteworthy that although newer and better ideas of structure had been given, yet many of the old notions of function were still taught.

This was done by William Harvey of England. He was born in 1578, studied at many universities, mainly at Cambridge and Padua, and in 1615 first clearly demonstrated the correct action of the heart and interpreted the history of the circulation of the blood. Harvey's old anatomical preparations of this age are still in existence. From this time onward newer interpretations were possible, and the study of anatomy and physiology, now correctly linked, made rapid strides. These newer vantage grounds of interpretation were further extended by the discovery of the microscope, and by this instrument the field of microscopical anatomy, or Histology (q.v.), was opened up, leading to far-reaching and important results to the welfare of mankind. The period of detailed and special advance may be said to have been foretold in the newly revived study of physics by Borelli and his school, and the newer chemistry of Van Helmont won from the mysticisms of alchemy. These united to interpret the results of anatomical research, and the general history of the subject of anatomy widens out, fan-like, into its several specialties. The subject of anatomy now becomes lost in the history of interpretations and applications, and the further developments of these are considered in these volumes under their special heads where the developments of the various branches of anatomical research are considered. See ANATOMY, COMPARATIVE; ANTHROPOLOGY; BIOLOGY; CHEMICAL PHYSIOLOGY; CYTOLOGY; EMBRYOLOGY; HISTOLOGY; PATHOLOGY; PHYSIOLOGY; SURGICAL ANATOMY.

Bibliography.— The most extensive of modern works on the history of anatomy is found with complete bibliography in Neuburger and Pagel's 'Handbuch der Geschichte der Medicin,' (2 vols., 1903); Garrison, 'History of Medicine' (1915); Buck, H., 'History of Medicine to 1800' (1917). Of descriptive anatomies there are many: Testut and Poirier in French; Bardelben and Spalteholz in German, the latter translated by Barker into English in 1903; Morris, Quain, Gray in English; Leidy, Gerrish and Huntington in America. The bibliography of the special subjects will be discussed in their sections. See MEDICINE, HISTORY OF.

SMITH ELY JELLIFFE.

ANATOMY, Comparative, is that subdivision of the science of zoology which deals with adult forms and structures of animals with a view to determining their relationships. Comparative Anatomy and Embryology, the latter dealing with the immature forms and structures of animals, constitute the science of Morphology, which treats of the structure, development, classification and relationships of animals as contrasted with Physiology, which deals with their functions. In contradistinction to special anatomy, which has for its aim the description of all the structures and parts of any one animal,— for example, man,— the method of comparative anatomy is to compare corresponding parts in many different species, noting their modifications and transformations with the ultimate purpose of determining the affinities or relationships of these species to one another. In the earlier history of this science the expressions "relationship" or "affinity" were used in a metaphorical sense, signifying merely relative positions in a system of classification. With the growth of the evolution idea, however, they have acquired a new and literal meaning, since the aim of modern morphology is to determine the genetic or blood relationships of animals to one another and thereby to trace the evolution not only of the species but also of the various organs and parts. The great value of the comparative method in science is nowhere better illustrated than in the study of

anatomy. There are probably not fewer than 1,000,000 known species of animals belonging to at least 10 or 12 distinct types. These animals exhibit the various organs of animal life under a great variety of forms, and by means of comparison it is possible to determine in each case what is universal and essential and what is merely local and accidental, and also to indicate the steps by which complexity of organization has been attained. Furthermore the comparative method throws a flood of light upon the significance of problematical and rudimentary structures such as the thyroid, the thymus and pineal glands of man, the purpose of which so puzzled the earlier anatomists. In fact it may fairly be said that it is impossible to comprehend properly any structure of the human body without considering it in relation to similar structures in other animals.

I. Principles of Comparative Anatomy.— It is obvious that in the study of animals various standards of comparison might be employed; for example, they might be compared as to color, size or length of life, but it is at once apparent that such comparisons would bring together animals of the most diverse characteristics in other respects. As contrasted with such a purely artificial classification it was long the aim of naturalists to find a natural system expressing the "affinity" between organisms which could frequently be better felt than described. It was the great merit of Cuvier, often called the founder of comparative anatomy, that he insisted upon the importance of comparing the totality of the internal structures as well as the external characteristics of animals. By means of such comparisons he reached the conclusion that there were four great independent branches or types of animal organization, namely, *Vertebrata, Mollusca, Articulata, Radiata,* each consisting of forms fundamentally like one another but unlike those of other types. The principal criterion used by Cuvier for determining this fundamental likeness or unlikeness was the relative positions of corresponding parts, particularly of the nervous system. "The type is the relative position of parts" (Von Baer). Richard Owen, a pupil of Cuvier, introduced the term homology to describe this fundamental likeness, defining it as "morphological correspondence in the relative position and connection of parts." He contrasted with this physiological correspondence of parts, which he named analogy. In closely allied animals, organs which are homologous are usually also analogous, but in less closely related ones this may or may not be the case. Organs having the same function may be structurally very unlike, for example, the wing of a bird and that of an insect; on the other hand, organs structurally similar may have very different functions, for example, the fore leg of a quadruped and the wing of a bird. This conception of homology lies at the very foundation of all morphological studies; it is the one criterion for determining likeness or unlikeness between organisms. Owen further distinguished between special and general homology, the former signifying fundamental likeness between corresponding parts of different animals, as in the case of the arm of man and the fore limb of a quadruped; while the latter refers to similar parts of the same individual, as in the case of the fore and hind limbs of a quadruped or the right and left sides of the body. Since the term general homology as used by Owen is liable to misinterpretation it would be well to replace it by the expression meristic homology (Bateson), signifying by this term morphological correspondence between parts of the same individual which may be repeated in any relation whatever. Meristic homology would thus include correspondence between parts which are repeated in a series, for example, the vertebræ of the spinal column (serial homology, homodynamy), between parts repeated on the right and left sides of the body, for example, right and left limbs (lateral homology, homotypy) and between parts repeated in any other relations, for example, the fingers of one hand, upper and lower teeth, etc. (vertical homology, homonomy).

Significance of Homology.— To Cuvier and his followers homology meant "conformity to type," to the "archetypal plan" established by the Creator. In the light of evolution, however, homologies are believed to be family or hereditary likenesses due to inheritance from some common ancestor. For this reason special homology might better be called homogeny (Lankester) or homophyly. Contrasted with this are such morphological resemblances as are not due to inheritance, but to similarity of environment acting upon forms of dissimilar descent; such false homology is called homoplasy (Lankester), homomorphy (Gegenbaur) or convergence. It is the task of comparative anatomy to apply to animal structures these criteria of likeness or unlikeness and to distinguish between these various kinds of homology. These various forms of homology are summarized in the following table:

Homology	Special Homology (Homogeny, Homophyly)	
	General Homology (Meristic Homology)	Homodynamy (Serial) Homotypy (Lateral) Homonomy (Vertical, etc.)
	False Homology (Homoplasy, Homomorphy, Convergence)	

II. General Structures and Functions of Animals.— Although the differences between the highest and the lowest animals are enormous there are nevertheless certain structures and functions which are practically the same in all animals whatsoever. All animals and plants without exception are composed of cells, while all the functions of living things are the resultants of the aggregate functions of the cells of which they are composed. The cell is thus the universal unit of organic structure and function (Cell Theory of Schleiden and Schwann), and has been defined as a mass of protoplasm enclosing a nucleus (M. Schultze). Protoplasm or living matter is a substance, usually semi-solid, of unknown but undoubtedly very complex chemical composition. It is probably composed of several complex compounds of C, H, O, and N, which do not form a mere mixture but are united in a definite and orderly way. Both the cell body and the nucleus are composed of protoplasm, though of very different quality in the two cases; that which forms the chief mass of the cell, the cell body, is called cytoplasm, while that constituting the nucleus is known as karyoplasm. At least these two kinds of protoplasm are found in every cell and are necessary to the continuance of vital activities. The cytoplasm

and karyoplasm are each composed of two or more different substances of visibly different structure, and all these parts are put together in an orderly manner so that they bear definite relations to one another. The cell, therefore, no less certainly than a complex animal, shows organization, that is, differentiation of unlike parts and integration of these parts into a single and complete whole.

As all organisms are composed of cells, so all living things have certain activities or functions in common. The most important of these are the following: (1) Metabolism, or the transformations of matter and energy within the living thing; this may be subdivided into anabolism, or the change of the matter and energy of food into the matter and energy of protoplasm; and katabolism, or the destructive changes in protoplasm by which the living matter is transformed into less complex substances (secretions, waste products, etc.), while its energy appears in various forms (heat, motion, etc.). Metabolism therefore includes nutrition, growth, waste and repair, movement, secretion and excretion. (2) Irritability, or the capacity of receiving, transmitting and responding to stimuli. (3) Reproduction, or the formation of new individuals from the substance of an old one. These general functions are characteristic of every living thing, plant or animal, simple or complex. From them all the functions of the most complex animal are built up, and as they are manifested in some degree by every cell it will be seen that the cell is the unit not only of organic structure but also of organic function.

All animals begin their individual existence as a single cell, but while some remain in this condition throughout life, others by repeated divisions of this initial cell become multicellular; the former constituting the group *Protozoa*, the latter the *Metazoa*. *Protozoa* are animals in which the entire body consists of a single cell, which usually leads an independent existence, though in some cases several may be united into a colony. In some forms the substance of this cell consists of protoplasm showing very little differentiation; in others it is differentiated into many unlike parts, each with its own specific function. The most general differentiation, apart from that of nucleus and cell body, is into a superficial dense layer, the ectoplasm, and a more fluid, granular interior, the endoplasm. Further specializations are shown by the more complex forms in the formation from the ectoplasm of contractile vacuoles, serving as organs of excretion; of thread-like processes, serving as organs of locomotion (cilia, flagellæ) of contractile fibres (myophan striations) which act like muscle fibres; of stinging threads (trichocysts) which serve as organs of defense; of a mouth and gullet through which food is taken into the interior of the cell, and of a calcareous or silicious skeleton, frequently of great complexity and beauty. All of these structures are differentiations of a single cell; they show how complex such a cell may become, and they indicate that the *Protozoa* are, in the words of one of the old zoologists, "perfect animals."

In all *Metazoa* the body is composed of many cells differing among themselves in certain respects. These cells have all arisen from a single one, the egg, which by repeated divisions (cleavages) gives rise to a group of connected cells. In typical cases these become arranged in a single layer, forming a hollow sphere, the blastula, which then, by the migration of certain surface cells into the interior, becomes a two-layered sphere; the gastrula, containing a central cavity; the archenteron, or primitive digestive sack, which opens at one place to the exterior by a pore, the blastopore or primitive mouth. The outer layer of the gastrula is called the ectoderm, the inner one the endoderm, while between them a third layer, the mesoderm, usually appears, being derived from one or both of the primary layers. These three layers are known as the germ layers and from them all the organs of the adult metazoan are derived. The ectoderm gives rise to the outer covering of the body, the nervous system and sense organs; the endoderm to the alimentary canal and its outgrowths, while from the mesoderm arise muscles, skeleton, circulatory, excretory and reproductive systems.

In all *Metazoa* the ectoderm and endoderm and frequently also the mesoderm consist of cells, flattened, cuboid or columnar in shape, pressed together side by side into a layer. This simplest and earliest grouping of cells in the metazoan body is called an epithelium. From one or more of these epithelial layers cells may escape into the space between the estoderm and endoderm and there become branched and irregular in shape, forming a loose grouping of cells known as **mesenchyme.** Epithelium and mesenchyme are the primary tissues of the metazoan body. They are the first formed in the development, and from them all other tissues are derived. The cells of one or both of these primary tissues may undergo further differentiation into contractile or muscle cells and into irritable or nerve cells, while the mesenchyme cells may give rise to non-living cell products such as fibres, spicules, cartilage, bone and fat. When cells of any one of these groups are united they constitute a tissue, so that in the body of a metazoan we recognize, in addition to epithelial and mesenchymatous tissue, muscular, nervous and sustentacular or connective tissue. Further consideration of these tissues belongs to Histology rather than to Comparative Anatomy. In all *Metazoa* two or more of these tissues may be united to form organs, which are structures of definite shape and individuality having for their purpose the carrying on of specific functions. Finally two or more organs may co-operate in a common function and are then known as an organ system. The principal systems of organs in the metazoan body are the following: (1) Integumentary; (2) Nervous; (3) Motor; (4) Skeletal; (5) Alimentary; (6) Respiratory; (7) Circulatory; (8) Excretory; (9) Reproductive.

III. Fundamental Form of the Metazoan Body.—Although the forms of multicellular animals are extremely varied they may all be referred to a single ground form, the gastrula. From the egg stage to the gastrula all *Metazoa* travel essentially the same road in their development; beyond the gastrula stage they diverge in many directions. The gastrula is therefore the latest developmental stage common to all *Metazoa* and must be taken as the fundamental form from which they all have been derived. It is typically a double-walled sac surrounding the archenteron or primitive digestive cavity, which opens at one pole to the exterior by the blastopore or primitive mouth. It is radically sym-

metrical around an axis connecting the oral and aboral poles; this is the primary or gastrular axis. In a few types — for example, sponges, hydroids, jellyfishes — this axis becomes the chief axis of the adult body; such animals constitute the group *Protaxonia*. In others (all bilateral animals) the chief axis of the adult lies almost at right angles to the gastrular axis, and it is derived in large part from one of the

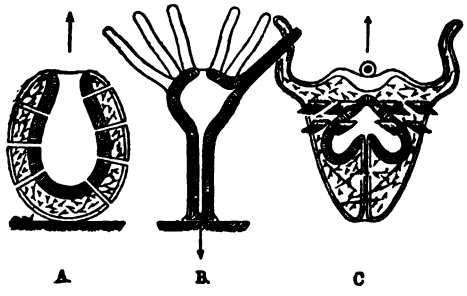


FIG. 1

FIG. 1.— Types of *Protaxonia* (= *Cœlenterata*) (from Hatschek). The chief axis of the gastrula coincides with that of the adult, the apical pole of the gastrula being indicated by the head of the arrow.—*A*, ground form of the *Spongiaria*. *B*, ground form of the *Cnidaria*. *C*, ground form of the *Ctenophora*.

secondary axes of the gastrula; these forms are known as *Heteraxonia* or *Bilaterata*. Among the *Protaxonia* the adult form is radically symmetrical and differs but little from the gastrula; this is especially true of the hydroids, some of which are practically gastrulas throughout life which are attached by the aboral pole and with a row of tentacles around the mouth. Among the *Heteraxonia*, on the other hand, the adult

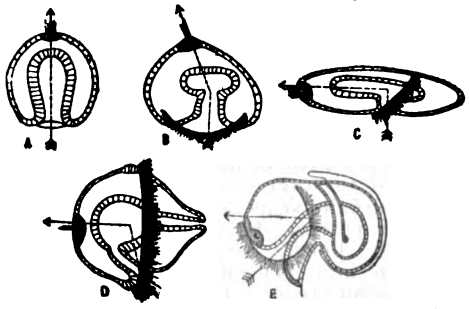


FIG. 2

FIG. 2.— Types of *Heteraxonia* (= *Bilaterata*). The gastrula axis becomes only in part the chief axis of the adult; the apical pole of the gastrula is shifted forward to the anterior end of the adult, while the oral pole of the former lies on the ventral side of the latter or near its anterior end, so that a more or less extensive bending of the gastrular axis occurs; in all cases the brain and eye arise at or near the original apical pole.—*A*, gastrula. *B*, *C*, larva and adult flatworm. *D*, larva of annelid (trochophore). *E*, larva of gastropod (veliger).

shows but little if any resemblance to the gastrula from which it is derived; this is the result not only of the change of axis just mentioned but also of the complication of the gastrular layers and the formation from them of complex organs and parts. In the change of axis it usually happens that the primary axis becomes so bent that the oral and aboral poles approach each other while at the same time one of the secondary axes elongates, becoming the principal axis of the adult, and the body becomes bilaterally symmetrical with reference to a plane passed through this axis and the original primary axis. The apical pole of the gastrula becomes the anterior pole of the adult; since brain and sense organs usually develop at this pole it might also be called the sense pole. The position of the oral pole of the gastrula with reference to the adult axis shows considerable variation in different groups, but among invertebrates it generally lies on the ventral side, while in the case of the vertebrates it is dorsal. The chief axis of the adult connects the anterior and posterior poles and is therefore known as the antero-posterior axis. The side of the body generally directed downward, and at the anterior end of which the mouth usually lies, is ventral, while the opposite side is dorsal and the line connecting these two is the dorso-ventral axis.

There are a few apparent exceptions to the rule that *Heteraxonia* are bilateral forms; some *Heteraxonia* are apparently radially symmetrical (starfish, sea-urchin), while others are asymmetrical (snails, amphioxus, flounders, etc.). The starfishes and sea-urchins are five-rayed animals which were classed by Cuvier among the *Radiata*, but a careful study of the larval as well as the adult form shows that they are really bilateral and that their radial structure has developed from a bilateral form, probably through the influence of peculiar life conditions, such as persistent attachment or fixation to foreign objects. Snails are generally spirally coiled and asymmetrical, but here also the study of their development shows that at an early stage they are bilateral, and even in the adult condition the head and ventral parts of the body are usually bilateral; the asymmetry of the dorsal part being due, perhaps, to its elongation and the shell formation covering it. In the case of other asymmetrical forms, like amphioxus, flounders, etc., it is certain that we are dealing with modifications of bilaterality due to peculiar conditions of life.

Another modification of the original metazoan ground form, the gastrula, which almost all *Metazoa* show, is due to the formation and development of a middle layer in a space, the blastocœle or primary body cavity, between the ectoderm and the endoderm, namely, the mesoderm. In the lowest *Metazoa* this consists of branched cells (mesenchyme) which are loosely packed together and contain no considerable spaces, or if present these spaces are only parts of the primary body cavity. Among the higher *Metazoa* the middle layer is usually divided into an inner portion lying next to the endoderm and an outer one next to the ectoderm. Between these two layers of mesoderm there remains a space which is the secondary body cavity or cœlom. This is lined by flattened mesoderm cells, the peritoneum, and is usually divided into right and left halves by two longitudinal partitions, the dorsal and ventral mesenteries, one of which lies dorsal to the alimentary canal and the other ventral to it; in some animals one or both of these may be destroyed. In segmented animals the cœlom may be further divided into a series of chambers by transverse partitions, the dissepiments. The excretory and sexual organs are developed in large

part from the walls of the cœlom and project into its cavity. The portion of the cœlom surrounding the heart is usually separated from the remainder of this cavity and is called the pericardium; while in the highest vertebrates (mammals) the anterior portion of the cœlom which contains the lungs is separated by the diaphragm from the posterior part containing the abdominal viscera.

A further complication of the metazoan body is introduced by the repetition of the principal organs of the body in a series, one behind the other; such repetition is known as metameric segmentation, and each segment of the body is called a metamere or somite. Many of the higher *Metazoa* (annelids, arthropods, vertebrates) show this form of segmentation. In the simplest cases each of these somites has its own section of the cœlom and its own sensory, nervous, muscular, alimentary, respiratory, excretory and sexual organs, and each may bear a pair of limbs or locomotor organs. Each somite, in short, contains all of the important organs and may properly be called a little body (somite). In more highly organized segmented animals the various segments are no longer alike (homonomous), but show physiological divisions of labor, some being differentiated for one function and some for another (heteronomous). In this way some of the organs named above disappear in certain segments while others become greatly enlarged or modified. Finally this specialization of the somites is carried one step farther in higher arthropods and in vertebrates in which we have an intimate fusion of metameres and coalescence of organs in certain regions such as to mask completely the fundamental segmentation. This is especially true of the vertebrates, the lower

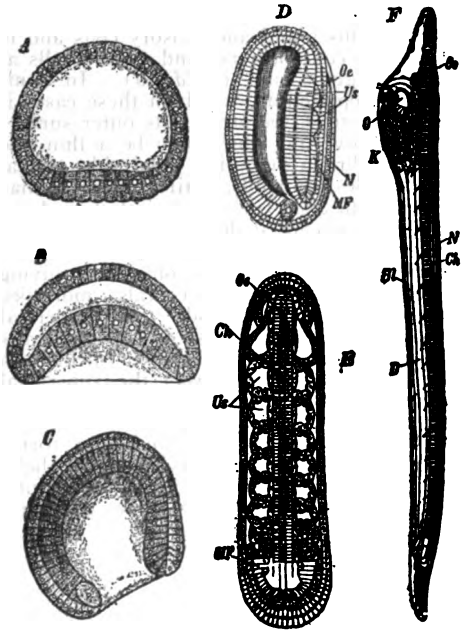


FIG. 3

FIG. 3.— Development of *Amphioxus* (from Claus after Hatschek), showing the derivation of the chordate from the gastrula.— *A*, blastula. *B*, *C*, *D*, gastrulæ. *E*, embryo. *F*, larva.— N, nerve-tube; *Oe*, its opening to the exterior; *Us*, mesoblastic somites; MF, mesoblastic fold; *Ch*, notochord; O, mouth; K, first gill-cleft; D, gut; *Bl*, ventral blood-vessel.

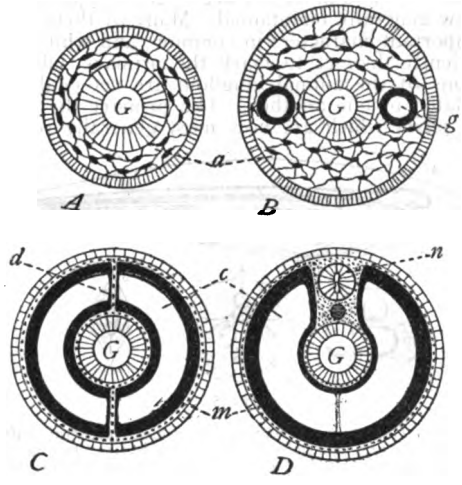


FIG. 4

FIG. 4.— Diagrams of body layers and cavities in *A*, cœlenterates; *B*, flatworms; *C*, annelids; *D*, vertebrates.— G, gastric cavity; *g*, cavity of gonad; *a*, primary body cavity (blastocœle) filled with branched cells (mesenchyme); *c*, secondary body cavity (cœlom); *d*, dorsal mesentery; *m*, mesenchyme filling space of original primary body cavity; *n*, nerve-tube.

forms of which group show segmentation of the axial skeleton (vertebræ and ribs) and attached muscles, of the nerves, of the gills and their blood vessels, and of the excretory and sexual organs; while in the higher vertebrates (reptiles, birds and mammals) segmentation is limited in the adult to the axial skeleton, muscles and nerves. The fusion of somites is most pronounced at the anterior end of the body; the head of insects contains three or four somites, while the vertebrate head is composed of not fewer than nine. Among arthropods the section of the body immediately behind the head and known as the thorax is composed of a number of fused somites, while in the posterior section of the body, the abdomen, the somites do not usually coalesce. Primitively the limbs are all alike and a pair is borne on each somite; however in higher annelids and arthropods they disappear entirely from certain somites and in others undergo great modifications of structure to fit them for particular functions. In the case of vertebrates they are limited to but two pairs, and it is probable that these are derived from a continuous lateral fin by the suppression of intervening portions. The great modifications and complications which have here been briefly sketched lead far from the simple form of the gastrula, and yet comparative anatomy and embryology show that the gastrula is the ground form of all *Metazoa* and they indicate in many cases the steps by which these most complex parts have arisen.

IV. Classification.— Although there is much difference of opinion as to the number of types

or phyla in the animal kingdom it is certain that there are more than the four recognized by Cuvier, the number being probably not less than 10 or 12. The present tendency among zoologists is to increase this number rather than to reduce it; but the absolute separateness and independence of these types is not now generally maintained. Many of them have important characters in common, and while sufficiently distinct to mark the primary subdivisions of the animal kingdom are yet evidently related to one another. The primary divisions or phyla which are now most generally recog-

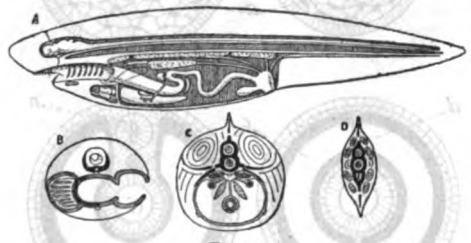


FIG. 5

FIG. 5.— Diagrammatic sections of an ideal vertebrate (after Parker and Haswell).— *A*, sagittal section showing the brain and spinal cord on the dorsal side of the notochord, and the alimentary canal and viscera on the ventral side of it. *B*, transverse section of the head, showing a gill-arch and filaments on the left and a gill-cleft on the right. *C*, transverse section of the trunk, showing the gut, the genital glands, and the excretory organs in the body cavity. *D*, transverse section of the tail.

nized are the following: (1) *Protozoa,* (2) *Spongiaria,* (3) *Cnidaria,* (4) *Ctenophora,* (5) *Platyhelminthes,* (6) *Nemathelminthes,* (7) *Rotifera,* (8) *Chætognatha,* (9) *Annelida,* (10) *Arthropoda,* (11) *Molluscoida,* (12) *Mollusca,* (13) *Echinodermata,* (14) *Chordata.* Some forms cannot with certainty be assigned to any of these groups, and new phyla may need to be established for them; on the other hand future work may show that two or more of the groups named may be combined under a single phylum. The value of these phyla so far as the number and variety of animals included in them is concerned is very unequal, some of them including but a single order and but a few genera, while others include many classes, orders and genera; in fact, about one-half as many species are known in a single order of the class *Insecta* as in all the remainder of the animal kingdom put together. A tabular classification of each of these phyla and of the classes into which it is subdivided is given on the three following pages:

V. Organ Systems.— When two or more organs are associated in carrying on a common function they constitute an organ system. Those systems most widely represented among animals, and therefore the most important, are those concerned with the general functions of all animals, namely, metabolism, reproduction and irritability. The first of these consists of several distinct though related functions, each with its own system of organs; accordingly we recognize the following systems: (1) digestive, (2) respiratory, (3) circulatory, (4) excretory, (5) motor, (6) reproductive, (7) nervous, (8) sensory; to these may be added those less important systems which serve for protection and support, namely, (9) integumentary, (10) skeletal. These organ systems will now be compared in broad outlines, with a view to showing their relationships in the leading phyla of the *Metazoa.* For the sake of convenience the integumentary, skeletal and motor systems will here be considered before any of the others.

1. *Integumentary System.*— In all animals the outer covering of the body consists of a layer of epithelial cells, the ectoderm. Beneath this layer a basement membrane is present, which in some animals is thick and serves for protection and support (*Cnidaria, Platoda*). This epithelium is frequently ciliated and it always contains gland and sensory cells and in addition may contain nerve and muscle cells as well as stinging cells (*Cnidaria*). In some animals the epithelium, which in these cases is called hypodermis, secretes on its outer surface a cuticular covering which may be a thin and flexible membrane or cuticle (hydroids, trematodes, cestodes, annelids, rotifers), or it may be thick and flexible (nemathelminths) or dense and inflexible except at the joints (arthropods). In other cases the epithelium secretes skeletal structures in certain regions only, thus giving rise to calcareous shells (corals, mollusks, brachiopods). In arthropods this epidermal secretion is particularly dense and tough and is known as chitin; it may become calcified in certain portions. In mollusks the superficial epithelium remains naked except in a certain region, the embryonic shell-gland, where it first secretes a cuticular covering and then forms beneath this a dense calcareous layer, the shell; at the margins of the shell-gland (mantle edges) the secretion of these layers continues throughout life.

CHIEF SUBDIVISIONS OF THE ANIMAL KINGDOM.

A. PROTOZOA: One-celled animals without gastric cavity, germ layers, or tissues.

Class 1. *Rhizopoda:* With streaming protoplasmic processes (pseudopodia). Example, *Amœba.*

Class 2. *Flagellata:* With one or two vibratile protoplasmic processes (flagellæ). Example, *Monad.*

Class 3. *Ciliata:* With many vibratile protoplasmic threads (cilia). Example, *Infusoria.*

Class 4. *Sporozoa:* Parasites without mouth or organs of locomotion. Example, *Gregarina.*

B. METAZOA: Many-celled animals with gastric cavity, germ layers, and tissues.

A. PROTAXONIA (= *Cœlenterata*): *Metazoa* with gastrula-like body, persistent gastrular axis and radial symmetry.

CHIEF SUBDIVISIONS OF THE ANIMAL KINGDOM — Continued.

B. METAZOA: Many-celled animals with gastric cavity, germ layers, and tissues — *continued.*

A. PROTAXONIA (= *Cœlenterata*): *Metazoa* with gastrula-like body, persistent gastrular axis and radial symmetry — *continued.*

I. SPONGIARIA: Fixed aquatic animals with numerous pores in body wall through which water is drawn into the gastric cavity and thence expelled through a large opening, the osculum. Complicated colonies are formed by incomplete budding.

Order (1). Calcarea: With skeleton formed of calcareous spicules. Example, calcareous sponge.

Order (2). Non-calcareous: With silicious, fibrous, or gelatinous skeleton. Example, commercial sponge.

II. CNIDARIA: Aquatic animals either attached (polyps) or free-swimming (*Medusæ*) with stinging cells (cnidæ). By incomplete budding the polyps may give rise to plant-like colonies (hydroids), or by complete budding to jellyfishes (*Medusæ*).

Class 1. *Hydrozoa:* Gastric cavity without septa and without ectodermal œsophagus.

Order (1). Hydromedusæ: Usually with alternation of hydroid (asexual) and medusoid (sexual) generations. Examples, hydroids, small jellyfishes.

Order (2). Siphonophora: Floating colonies of many polymorphic zooids. Example, Portuguese man-of-war.

Class 2. *Scyphozoa:* With radial septa in gastric cavity and with ectodermal œsophagus.

Order (1). Scyphomedusæ: The solitary polyp divides into a series of jellyfishes with notched margins. Example, large jellyfishes.

Order (2). Anthozoa: The polyps divide but do not form jellyfishes. Examples, sea-anemones, corals.

III. CTENOPHORA: Two-rayed radiates with sense organ at apical pole of gastrula, with mouth and ectodermal œsophagus at opposite pole and with eight meridional rows of vibratile plates which serve as locomotor organs; without stinging cells. Example, the Venus girdle.

B. HETERAXONIA (= *Bilaterata*): Animals in which the chief axis of the adult body is not that of the gastrula; symmetry bilateral.

IV. PLATYHELMINTHES: Flatworms with mouth usually on ventral surface and with apical (sensory) pole of gastrula near anterior end of body; primary body cavity filled with mesenchyme, no true cœlom.

i. PLATODA: Gastric cavity, when present, with but one opening to the exterior, the mouth.

Class 1. *Turbellaria:* Free living forms; body covered by cilia. Example, planarians.

Class 2. *Trematoda:* Parasites without coat of cilia but with external cuticle; with suckers for attachment to host. Example, flukes.

Class 3. *Cestoda:* Parasites without mouth or alimentary canal; with external cuticle, but without cilia; usually incompletely divided into segments (proglottides). Example, tapeworms.

ii. NEMERTINEA: Free living worms with external covering of cilia; with mouth, alimentary canal, and anus; with protrusible proboscis at anterior end of body. Example, *Cerebratulus.*

V. NEMATHELMINTHES: Round worms, mostly parasitic, with long, unsegmented bodies covered by a dense cuticle; with primary body cavity; without cilia.

i. NEMATODA: Thread worms without mesenteries or peritoneum; with nerve ring around œsophagus and dorsal and ventral nerve trunks. Examples, pinworms, vinegar-eels.

ii. GORDIACEA: Hair worms parasitic during part of life; with mesenteries and peritoneum; with nerve ring and ventral nerve trunk. Example, horsehair worms.

iii. ACANTHOCEPHALA: Internal parasites without alimentary canal; with proboscis and hooks for attachment to host. Example, *Echinorhynchus.*

VI. ROTIFERA: Wheel animalcules with body divisible into head (trochal disk), trunk and tail (foot); with wheel or crown of cilia around head; with primary body cavity and with grinding stomach (mastax). Example, wheel animalcules.

CHIEF SUBDIVISIONS OF THE ANIMAL KINGDOM — Continued.

B. METAZOA: Many-celled animals with gastric cavity, germ layers, and tissues — *continued.*

B. HETERAXONIA (= Bilaterata): Animals in which the chief axis of the adult body is not that of the gastrula; symmetry bilateral — *continued.*

VII. CHÆTOGNATHA: Small marine worms with three body segments, namely, head, trunk and tail; with horizontal fins around tail and on sides of trunk; with bristles (chætæ) on sides of mouth; with true cœlom (secondary body cavity). Example, arrow-worms.

VIII. ANNELIDA: Ringed worms with segmented bodies and true cœlom; the segments (somites) are typically similar (homonomous) and each encloses a section of the cœlom and of the vascular, excretory and nervous systems.

Class 1. *Chætopoda:* Worms with bristle-like appendages (chætæ), which usually serve as organs of locomotion, on every somite. Example, earthworm.

Class 2. *Gephyrea:* Marine worms with few traces of segmentation; with crown of tentacle around mouth and with U-shaped alimentary canal, the anus opening near the mouth.

Class 3. *Hirudinea:* Worms with flattened bodies and rudimentary cœlom, without chætæ, but with anterior and posterior suckers. Example, leeches.

IX. ARTHROPODA: Animals with jointed bodies and legs; without cilia, but with the entire surface of the body covered by a coat of dense substance, chitin.

i. BRANCHIATA: Aquatic animals with gills.

Class 1. *Crustacea:* With two pairs of antennæ (feelers) and usually with gills borne on the legs. Examples, lobster, crab.

ii. TRACHEATA: Land animals with internal respiratory cavities (tracheæ, lung books).

Class 1. *Onychophora:* Worm-like animals with numerous short legs. Example, *Peripatus.*

Class 2. *Myriopoda:* Animals with head and many-jointed body, every segment bearing one or two pairs of legs. Example, centipedes.

Class 3. *Insecta:* Animals with body divisible into head, thorax, and abdomen; with four pairs of appendages on head, three pairs of walking legs on thorax, but without appendages on abdomen. Example, grasshoppers.

Class 4. *Arachnida:* Body divisible into cephalo-thorax and abdomen; with six pairs of appendages on former, but none on latter. Examples, scorpions, spiders.

X. MOLLUSCOIDA: Unsegmented animals, usually stalked and attached, living singly or in colonies; with a crown of ciliated tentacles around the mouth; generally with U-shaped alimentary canal and with anus opening near mouth.

Class 1. *Phoronida:* Single, stalked animals with body cavity partially divided into three portions. Example, *Phoronis.*

Class 2. *Brachiopoda:* Single animals with calcareous shell consisting of dorsal and ventral valves. Example, brachiopods.

Class 3. *Polyzoa:* Stalked animals which usually give rise to colonies by incomplete budding. Example, *Bugula.*

XI. MOLLUSCA: Unsegmented animals with reduced cœlom; differing greatly in form, but usually having a head, with tentacles and eyes; with a rasping organ (the lingual ribbon or radula) in the mouth; with dorsal visceral sac containing most of the viscera; with a free fold of the body wall, the mantle, which usually secretes a shell, and with a ventral muscular foot.

Class 1. *Pelecypoda:* Bivalve mollusks without head or lingual ribbon; with filiform or plate-like gills. Examples, clams, oysters.

Class 2. *Amphineura:* Bilateral animals with paired nerve trunks. Example, chitons.

Class 3. *Gasteropoda:* Unsymmetrical mollusks, with univalve shell, usually spirally coiled. Example, snails.

Class 4. *Scaphopoda:* Small mollusks with tubular, uncoiled shells. Example, *Dentalium.*

Class 5. *Cephalopoda:* Active, predaceous mollusks with unpaired mantle and shell and with eight or ten arms which bear suckers. Example, squid, octopus.

CHIEF SUBDIVISIONS OF THE ANIMAL KINGDOM — Concluded

B. METAZOA: Many-celled animals with gastric cavity, germ layers, and tissues — *concluded.*

B. HETERAXONIA (= *Bilaterata*): Animals in which the chief axis of the adult body is not that of the gastrula; symmetry bilateral — *concluded.*

XII. ECHINODERMATA: Five-rayed marine animals, with dermal skeleton of spines or plate; with ambulacral system of tubes which are filled with sea-water.

Class 1. *Holothuroidea:* Soft, worm-like animals with reduced skeleton; the mouth surrounded by retractile tentacles. Example, sea-cucumbers.

Class 2. *Echinoidea:* Spherical or oval forms with complete armor of dermal plates. Example, sea-urchins.

Class 3. *Asteroidea:* With five arms radiating from a central disk; with open ambulacral grooves on the oral side of arms. Example, starfishes.

Class 4. *Ophiuroidea:* With arms and central disk, but with closed ambulacral grooves. Example, brittle stars.

Class 5. *Crinoidea:* The cup-shaped body bearing many branching arms is usually attached by a stem. Example, stone-lilies.

XIII. CHORDATA: Bilateral, segmented animals with an axial skeleton, the notochord, on the dorsal side of which is the tubular nervous system and on the ventral side the alimentary canal; with gill slits opening laterally through the walls of the pharynx.

i. HEMICHORDA: Worm-like animals which burrow in the sand. Example, *Balanoglossus.*

ii. UROCHORDA: Sac-like animals enclosed in thick tunic (*Tunicata*) in which are inhalent and exhalent openings. Example, sea-squirts.

iii. CEPHALOCHORDA: Fish-like animals, pointed at both ends, which burrow in the sand; without skull or brain (*Acrania*). Example, *Amphioxus.*

iv. VERTEBRATA: Chordates with skull and brain; with relatively few gill slits; the notochord serves as a foundation for the vertebral column; usually with two pairs of locomotor appendages.

(a). **Anamnia**: Aquatic vertebrates with functional gills; without embryonic membranes.

Class 1. *Cyclostomata:* Eel-like fishes without jaws, but with circular sucking mouths; with single olfactory organ; without paired fins. Example, lamprey.

Class 2. *Pisces:* Cartilaginous and bony fishes with paired olfactory organ, movable jaws, persistent gill clefts, two-chambered heart, paired and median fins, and dermal exoskeleton of scales. Examples, sharks, trout, lung-fish.

Class 3. *Amphibia:* Vertebrates with pentadactyl limbs with gills and gill clefts in larval life which may be lost in the adult; heart three-chambered. Examples, frogs, newts.

(b). **Amniota**: Air-breathing vertebrates in which the gills are never functional; the embryo is surrounded by embryonic membranes (amnion and allantois).

Class 4. *Reptilia:* Body covered by horny scales or plates; heart usually three-chambered; one occipital condyle; both aortic arches persistent. Examples, snakes, alligators, lizards, turtles.

Class 5. *Aves*: Birds with body covered with feathers and usually fitted for flight; with four-chambered heart and single occipital condyle. Examples, sparrow, ostrich.

Class 6. *Mammalia:* Animals with the body covered with hair; with mammary glands for suckling the young; with four-chambered heart and with two occipital condyles. Examples, duck-bill, opossum, man.

In reptiles, birds and mammals the superficial epithelium (epidermis) becomes many layers thick, and the outer layers of cells die and are transformed into horny or cuticular substance, an adaptation to life out of water. In these three classes of vertebrates there are also a number of characteristic epidermal outgrowths: in reptiles these take the form of horny scales or plates; in birds they appear as feathers, which are only modified scales; and in mammals as hair, while nails or claws are formed from the epidermis in all of these classes. In the mammals there are also epidermal ingrowths which give rise to various types of glands, such as sweat, oil, wax and milk glands, all of which are epidermal in origin.

Beneath the surface epithelium, which is always ectodermal in origin, there is in many animals a fibrous or connective tissue layer known

as the dermis or leather skin, since leather is always derived from this layer of skin. This layer is especially well developed among echinoderms and vertebrates, in which it may give rise to skeletal spicules or plates, thus forming a dermal exoskeleton. Among vertebrates this is especially well developed in the fishes, the scales which cover the body being of dermal origin; in some cases these dermal scales are covered by enamel which is derived from the epidermis. The same is also true of the teeth of vertebrates; the inner portion or dentine is of dermal origin, while the enamel comes from the epidermis; teeth are in fact only modified scales.

2. *Skeleton.*— An internal skeleton, not the product of the integument, is present in relatively few invertebrates, but is found in all vertebrates. Such a skeleton is found in sponges in the form of calcareous, silicious or horny spicules; in cnidarians and ctenophores as supporting jelly; in many invertebrates as a system of connective tissue cells and fibres; in cephalopods and certain arthropods as cartilages surrounding the central nervous system. On the other hand the possession of a primitive axial skeleton, the notochord, is one of the chief characteristics of the *Chordata;* in addition to this there are generally present in this phylum many other skeletal elements which are usually cartilaginous or bony. In all true vertebrates the notochord becomes surrounded by cartilage, and the whole is then constricted into a series of segments, the centra of the vertebræ; on the dorsal side cartilaginous arches develop around the spinal cord, while other skeletal arches, the ribs, surround the trunk and become connected with the vertebral column; finally the ribs may be united ventrally, thus forming the sternum: these parts constitute the axial skeleton. In addition there is the skeleton of the head (the skull) and that of the limbs (the appendicular skeleton). In the lower vertebrates and in the embryos of all higher forms the skull consists of a cartilaginous cranium partially surrounding the brain, and of paired cartilaginous rods forming the skeleton of the jaws and gill-arches. In higher vertebrates these cartilaginous elements undergo ossification, and in addition dermal bones are formed which partially overlie this cartilaginous basis. The appendicular skeleton consists of the two limb-girdles partially enclosing the trunk on the ventral side, the pectoral and pelvic arches, and of the skeleton of the limbs themselves. In the fishes the arches and limbs are peculiar and it is difficult to homologize their skeletal parts with those of higher forms; in all vertebrates above the fishes, however, the relations of these parts are similar and their homologies not difficult to determine.

3. *Motor System.*—All animals at some time in their lives have the power of locomotion, though in some cases this is lost before adult life is reached and the animal becomes fixed like a plant (hydroids, sponges, crinoids, molluscoids and many parasites). However, in all these cases certain parts of the body preserve the power of movement, though the animal as a whole is incapable of locomotion. Animal movement is of three fundamental types: amœboid, ciliary and muscular. See MUSCLES.

(1) Amœboid movement is manifested especially by free cells and exhibits a streaming of semi-fluid protoplasm: it is typically illustrated by the proteus animalcule *Amœba.* In this protozoan small lobes or pseudopodia may appear anywhere on the body, and into one or more of these the endoplasm, with all that it contains, may be seen to stream, at the same time being withdrawn from other lobes. This flowing may continue for some time in a given direction, the outflow of protoplasm at one end of the body being compensated for by the inflow at the other end, thus producing an actively progressive movement. The mechanism of this movement is obscure, but in some cases it seems to be associated with temporary inequalities in the tension of the surface of the cell; at points where the surface tension is reduced an outflow of protoplasm occurs, forming a lobe or pseudopod, into which protoplasm from the main body continues to flow so long as the surface tension is least in this direction. Usually several points of reduced tension exist at the same time on the surface of an amœboid cell, so that several lobes or pseudopodia are found radiating from a common centre. In other cases it is, perhaps, due to the general contractility of protoplasm, local contraction in one part of a cell causing an outflow in another part.

(2) Ciliary movement consists in the rhythmical beating of innumerable small protoplasmic threads (cilia) which project from the free surfaces of certain cells and which act somewhat like oars. Among one-celled organisms the entire cell may be covered by these cilia; in all multicellular animals they are limited to the free borders of certain epithelial cells. The beating of a cilium includes two movements,— the stroke, which is rapid and by which the cilium is sharply bent in one direction, and the recovery of the original position, which is relatively slow and weak. It is probable that the cause of this beating is the unequal contraction of the protoplasm on different sides of a cilium, by which it is bent first in one direction and then in the other. All the cilia covering a free surface beat in unison, the stroke being in one direction, and the movement is so timed that beginning at one end of a ciliated tract it seems to pass in a wave-like movement to the other end.

(3) Muscular movement, the principal type of motion in higher animals, is caused by the contraction in one direction of a muscle fibre consisting of a kind of protoplasm especially differentiated for this purpose. During the contraction or expansion of a muscle there is no change in its volume, the shortening of a fibre in one axis being compensated for by its expansion at right angles to that axis. Such a change in the shape of a fibre could be produced only by a change in the shape of the particles of which it is composed or by a change in their relative positions. The latter is probably the real cause of muscular contractility.

All of these types of movement are found in certain *Protozoa* and in many *Metazoa.* Amœboid movements are, however, usually restricted to free cells without membranes or dense cortical layers of protoplasm, such as certain egg cells, embryonic cells, endoderm cells, excre-

tory, pigment and lymph cells of various *Metazoa*; in no case is this type effective in the movement of large bodies. In the larvæ of all phyla, except the nemathelminthes and arthropods, locomotion is brought about, at least in part, by cilia, and even among the adult forms of many lower metazoans this is the principal type of locomotion (ctenophores, turbellarians, nemertines, rotifers). Among the nemathelminthes and arthropods cilia are entirely lacking throughout the whole life cycle. Among large animals locomotion is effected entirely by muscular contractibility, while cilia are limited to certain regions where by their beating they produce currents. Muscle fibres are found in all *Metazoa* with the possible exception of sponges; they are of two kinds, striped and non-striped or smooth; the latter are of very wide distribution throughout the *Metazoa*, the former are limited to a few phyla (mollusks, arthropods, chordates). Smooth muscle is contractile to a much greater extent than striped muscle, but is much slower in action. The muscular system may consist of isolated fibres such as are found in many cnidarians, platodes and rotifers, or these fibres may be united into bundles or sheets as is the case in most higher animals; these groups of muscles show many differences and can be compared only in a general way. In general the arrangement of the body muscles depends upon the presence or absence of a skeleton. Animals which have no skeleton usually have the body musculature arranged in the form of two coats: an outer layer of circular fibres and an inner of longitudinal ones, while the intestinal musculature is also arranged in two coats, the outer (next the cœlom) longitudinal and the inner circular. If an exoskeleton is present, as in arthropods, these muscular layers of the body wall are broken up into bundles which become attached to the skeleton; if an endoskeleton is present, as in vertebrates, the muscles become attached to the bones, which serve as levers, and thus the muscles come to lie at a deep level. The locomotor apparatus of echinoderms is unique, consisting of a great number of tube feet, which are hollow muscular tubes, closed at the end by a sucking disk. The cavity of each tube is connected with the water vascular (ambulacral) system within the body, from which water can be forced into the tube feet. In this way they are protruded until the sucking disk touches and becomes attached to some object; then by contraction of the muscles of the foot the water is forced back into the water system, and by simultaneous action of many of these feet the body is slowly warped along.

4. *Digestive System.*—With the exception of a few internal parasites which absorb their food in a digested condition from the bodies of their hosts, some form of digestive system is present in all animals.

Digestion is the process of rendering insoluble foods soluble. One of the distinguishing characteristics of animals is that they, unlike plants, take in solid food (much of which is in a colloidal condition) through a mouth opening (ingestion), and that by the process of digestion some of this insoluble food is rendered soluble and hence capable of diffusing to all parts of the organism, where by a mysterious process known as assimilation some of it is built up into the substance of the protoplasm itself. After the substances rendered soluble by digestion have been removed from the food the indigestible remnants are cast out of the body in solid form (egestion). Among the *Protozoa* digestion occurs within the body of a single cell, that is, it is intracellular. The same is true of the sponges, in which the food, consisting of microscopic animals or plants, is taken in by certain epithelial cells lining the cavities of the sponge and by them passed over to other cells and tissues by which the food particles are ingested, digested and assimilated. In all animals above the sponges intracellular digestion is limited to endoderm cells and to certain mesoderm cells, such as white blood corpuscles (leucocytes) and it is of decreasing importance as one ascends the scale. In all animals except the lowest, digestion occurs principally in a digestive cavity surrounded by cells which pour their secretions into the cavity. By the action of these secretions certain insoluble food substances are transformed into soluble ones. This digestive cavity is in all cases derived from the archenteron or primitive digestive cavity of the gastrula and in the simplest cases is little more than a sac whose walls may be folded into ridges or septa, thus enlarging the digestive surface (*Anthozoa*), *or* they may be extended to form tubular canals, by means of which the digested food is distributed to all parts of the animal (*Scyphozoa, Ctenophora, Turbellaria*). In all *Cnidaria* except the lowest class, and in all animals above the *Cnidaria*, the ectoderm surrounding the mouth is folded in at the mouth opening, thus forming an ectodermal tube, or œsophagus, which opens at the inner end into the gastric cavity. Among chordates this ectodermal invagination forms only the mouth cavity, the œsophagus being derived from the endoderm. In all *Cnidaria, Ctenophora* and *Platoda* there is but one opening into the gastric cavity, the mouth, and through this single opening food is taken in and undigested remnants cast out. In the *Nemertinea*, and with a few exceptions in all higher animals, there is a second opening into the gastric cavity, namely, the anus, through which the ejecta pass. The anus is formed by an infolding of the ectoderm which meets and fuses with a portion of the archeuteric wall; this terminal ectodermal portion of the digestive tract is the hind gut (of invertebrates). With the formation of an anus the digestive tract becomes tubular, with mouth at one end and anus at the other, and the entire canal is divisible into three portions, an ectodermal fore gut, an endodermal mid gut and an ectodermal hind gut. The relative development of these three portions differs much in different phyla; for example, among chordates the fore gut is limited to the mouth cavity and the hind gut to an insignificant terminal portion of the intestine, while the endoderm gives rise to all the intervening portions of the digestive tract. Among arthropods, on the other hand, the mid gut is limited to an extremely small portion of the digestive tube between the stomach and intestine, while all the remaining portions are derived from the fore and hind guts. In the higher animals the fore and mid guts may be subdivided into mouth cavity, pharynx, œsophagus, stomach and intestine and in some cases these portions may be further subdivided, as,

for example, in birds, where the œsophagus gives rise to an enlargement, the crop, the stomach is divisible into a glandular stomach and a grinding stomach or gizzard, and the intestine consists of two portions, the small and the large intestine. Finally into a portion of the hind gut the excretory and sexual ducts as well as the intestine may open, in which case this common chamber is called the cloaca. Various portions of the fore gut may be armed with teeth, usually of a horny character among invertebrates, and the pharynx may be protrusible. The digestive and absorptive surfaces of the mid gut may be increased in three different ways, either (1) by an increase in length, in which case it becomes folded or coiled, or (2) by folds which project into the canal, or (3) by diverticula, that is, blind sacs or tubes, which open out from the canal; in many higher forms all of these methods coexist in the same individual. The extent of the digestive surface depends primarily upon the character of the food; if the latter is highly nutritious the digestive surfaces are much smaller than where it is poor in nutrition. In carnivorous mammals, for example, the alimentary tract is from four to five times the length of the body, whereas in certain herbivora it may be from 20 to 30 times the length of the body. In the simplest *Metazoa* it is probable that all the cells lining the digestive cavity are alike and that they all secrete the same digestive fluids; in more complex animals the cells differ in structure and function in different portions of the tract. By a specialization of the diverticula or blind tubes opening out from the canal, large digestive glands are formed which pour particular digestive secretion into the alimentary canal. The most generally distributed of all these are the salivary glands, opening into the fore gut, and the liver and pancreas (or where both are united, as often happens among the invertebrates, the hepatopancreas), which open into the mid gut. In all of the lower invertebrates except the roundworms the food is moved about in the alimentary tract by means of cilia or by general contractions of the body. In all higher forms the contraction of muscle fibres surrounding the canal play an important part in this movement, though cilia may also be present. In the chordates both longitudinal and circular muscles surround the canal and by their rhythmical contractions produce a wave-like contraction of the canal (*peristalsis*), which passes along the canal from mouth to anus.

5. *Respiratory System.*— Respiration consists in the exchange of gases between the body and the medium which surrounds it. The gas given off from the body is principally carbon dioxide, one of the products of combustion within the body, while that which must be supplied to it is oxygen. Since oxidation is the one essential feature of destructive metabolism which occurs in all living matter, it follows that respiration is a universal function among organisms. Among small and simple animals this exchange of gases takes place directly between the living cells and the surrounding medium and occurs all over the surface of the body. In more complex forms with body fluids the exchange takes place between the tissues and the fluid (internal respiration) and then between the fluid and the surrounding medium (external respiration). This exchange may take place through the general integument of the body without the aid of any specific organs, as is the case in all small animals and in many larger ones,— for example, flatworms, roundworms, rotifers, small annelids, and even some vertebrates, such as the lungless salamanders. However, in most animals of any considerable size, special organs exist to facilitate this exchange. In such as dwell in water vascular processes are present which serve to bring the blood into close relation with the water. These processes, which are called branchiæ or gills, are covered by a thin epithelium through which an interchange of the gases contained in the blood and in the water can readily take place. To facilitate this interchange the gills are usually much folded or branched so as to afford a large surface,

FIG. 6.

FIG. 7.

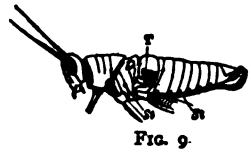


FIG. 9.

FIG. 8

FIG. 6.— Section through the gill-arch and plates of a bony fish (from Claus).— *b*, gill-plates with capillaries; *c*, afferent vessel with venous blood; *d*, efferent vessel with arterial blood; *a*, skeleton of arch.

FIG. 7.— Part of a tracheal stem and branches of an insect (from Claus).— *Z*, cellular outer wall. *Sp*, cuticular inner wall with spiral fibre.

FIG. 8.— Tracheal system of a fly larva (from Claus).— *Tr*, longitudinal stem of right side. *St'*, *St''*, anterior and posterior stigmata. *Mk*, mouth parts.

FIG. 9.— Lateral view of grasshopper (*Acridium*).— *St*, stigmata. *T*, tympanal organ (from Claus).

and they are frequently covered by cilia which serve to keep the water in motion, while at the same time the blood is circulated through them. The most primitive type of gill is that of a simple ciliated tentacle, which may also serve other functions, such as is found among the *Molluscoida* and some *Mollusca;* such gills may become branched or plume-like or may fuse together into plates (*Lamellibranchia*). Gills are situated on those parts of the body where they will be most exposed to fresh water, and occur in the most extraordinary different positions in different phyla; thus they may be found on the limbs (*Crustaceæ*, some annelids), on or around the head (sedentary annelids, molluscoids), along the sides of the body (primitive mollusks), on the lateral walls of the pharynx (chordates) or as outgrowths of the hind gut (holothurians). Homology being "correspondence in the relative position and connection of parts," there can of course be no homology between structures occurring in such diverse positions, and yet within a given phylum

they may be homologous and of high morphological value (for example, chordates). Among the chordates a series of gill-clefts opens right and left through the walls of the pharynx, and in the lower classes of the phylum the gills are found as highly vascular plates or tufts on the outer sides of the arches separating these clefts; water is taken in through the mouth and then forced out through the gill-clefts and thus over the gills. In the higher classes of the phylum (reptiles, birds and mammals), the gill-clefts are present during embryonic life, though at no time in their entire life-history do these animals have gills and respire water. The constancy of gill-clefts among vertebrates gives this character a high value in determining the affinities of such doubtful forms as *Balanoglossus*, *Cephalodiscus*, and *Tunicata*.

In animals which do not dwell in water and in some few which do (insect larvæ, lung fishes, etc.), certain infolded portions of the body occur into which air is drawn and from which it is again expelled. Among invertebrates these infolded portions are generally derived from the skin; among vertebrates from a portion of the alimentary canal, the pharynx. In the case of insects and allied forms (*Tracheata*) these infolded portions have the form of much-branched tubes, the tracheæ, which reach to all parts of the body, the terminal twigs of the tracheal system of tubes being found in connection with almost every bit of tissue in the body. These tracheæ open to the exterior through closeable pores, the stigmata, situated on the sides of the body; air is taken in through these pores and by means of the tracheal tubes penetrates to all parts of the body, the exchange of gases taking place directly between the tissues and tracheæ. Among vertebrates lungs develop as an evaginated portion of the pharynx; in most fishes this is a hydrostatic apparatus, the swimbladder, but in the lung fishes (*Dipnoi*) it becomes highly vascular and may serve as a lung. In all higher vertebrates this sac is paired, and its walls, which in the lower classes are relatively simple, become much infolded and very richly supplied with blood vessels. The exchange of gases here takes place between the blood and the air within the lung, and in most vertebrates the oxygen-carrying capacity of the blood is increased by the presence of hæmoglobin (the coloring matter of red blood corpuscles) which enters into a loose chemical combination with the oxygen.

6. *Circulatory System.*— The physiological significance of the circulation of fluids within the body is the distribution of nutriment and in some cases oxygen to all the parts. In the simplest *Metazoa* (*Cnidaria, Ctenophora*) there is no need of a special circulatory apparatus other than that which is furnished by the gastric cavity itself; this may branch and extend to various parts of the body or hydroid colony, thus forming a gastro-vascular system, through which the distribution of nutriment takes place; the branched gastric cavity of certain turbellarians serves also a similar function. Circulation of body fluids also occurs in many lower animals without the aid of any special circulatory apparatus; in such cases lymph, containing the products of digestion, is distributed through all the intercellular spaces in the primary body cavity, and by the contractions of the general musculature of the body it is kept in irregular movement. With the single exception of the nemerteans a blood vascular system is found only among animals with a secondary body cavity or true cœlom and is lacking even in some of these, particularly such as are quite small or are evidently degenerate forms. With a few exceptions it is present in mollusks, echinoderms, annelids, arthropods and all chordates. In its simplest form it consists of branching and anastomosing tubes which contain blood. The walls of the tubes are composed of flattened epithelial cells (endothelium) which may be surrounded on the outside by muscle or connective tissue fibres. The blood which fills these vessels consists of a fluid or plasma within which floating cells or corpuscles are almost invariably present. With increasing complexity of this system the walls of the vessels become thicker by increase of the muscular or connective tissue coats, and in certain parts of the system the vessels become larger. The muscular walls may be pulsatile throughout the entire length of a vessel, or this function may be limited to a small portion of a large vessel, which is then known as a heart; even in the highest animals the heart is only a differentiation of a simple pulsatile blood vessel. The vessels leading away from the heart are the arteries, those through which the blood flows back to the heart the veins, while the small thin-walled vessels connecting the two, and through the walls of which plasma

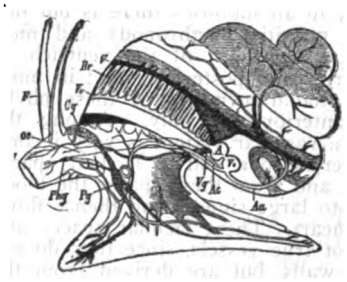


FIG. 10

FIG. 11

FIG. 10.— Circulatory and nervous systems of a snail (*Paludina*) (from Claus after Leydig).— *F*, tentacles; *Oe*, œsophagus; *Cg*, cerebral ganglion; *Pg*, pedal ganglion and otocyst; *Vg*, visceral ganglion; *Phg*, pharyngeal ganglion; *A*, auricle of heart; *Ve*, ventricle; *Aa*, abdominal aorta; *Ac*, cephalic aorta; *V*, veins; *Vc*, branchial veins; *Br*, gills.

FIG. 11.— Anterior part of the circulatory system of an annelid (*Sænuris*).— The arrows indicate the direction of the flow. *H*, heart-like enlargement of a commissural vessel.

escapes into the tissues, are the capillaries. Among the annelids there is a large dorsal vessel and a ventral one, which are connected in each somite by commissural vessels. The dorsal vessel is pulsatile along its whole length, and peristaltic contraction waves can be seen in a living worm to pass from the posterior to the anterior end; correspondingly the blood flows forward in the dorsal vessel, down through the commissural vessels into the ventral one, and then backward through the latter to the posterior portion of the body, where the blood ascends through commissural vessels to the dorsal vessel, after which the same circuit

is repeated. Throughout this whole course the blood flows through vessels with definite walls, and the circulation is said to be closed. Among the molluscs and arthropods a heart is present

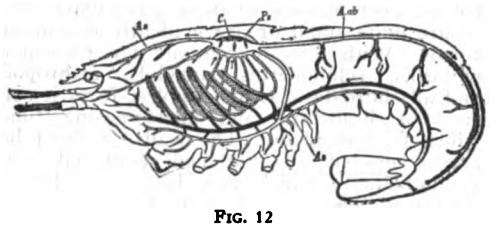


FIG. 12

FIG. 12.— Circulatory and respiratory systems of the crayfish (from Claus).— *C*, heart with three pairs of ostia; *Ps*, pericardium; *Ac*, cephalic aorta; *A. sb*, abdominal aorta; *As*, sternal artery. The arrows indicate the direction of the flow.

which is more concentrated and complete than among the annelids. In the arthropods this consists of a thick-walled, pulsatile tube lying on the dorsal side of the body and extending through several somites; in each somite are a pair of openings, the ostia, which open into the heart from the pericardium, and through which returning blood enters the heart. Among the molluscs the heart is also of a compact type and is divided into auricular and ventricular portions. Primitively two auricles are present, though in some gasteropods this number is reduced to one; in all molluscs there is but one ventricle. In primitive arthropods and molluscs the blood flows out of the ventricle at both the anterior and posterior ends; in more highly differentiated members of these phyla, out of the anterior end only. Among the arthropods the vascular system is very incomplete, the arteries soon end in lacunar spaces in the tissues, and from these spaces the blood is gathered into large sinuses and thence flows back to the heart. These lacunar spaces and sinuses are not true vessels, since they do not haye definite walls, but are derived from the primary and secondary body cavities; the circulation is therefore an open one. Among the molluscs the vascular system is more extensive than among the arthropods, but here also the circulation is open, except in the cephalopods, the arteries being connected with the veins by a system of lacunar spaces instead of capillaries. Finally among the echinoderms and chordates the circulation is closed as among the annelids; that is, the blood throughout its entire circuit is contained within definite vessels.

The manner in which blood is supplied to the respiratory organs is of great importance in explaining the structure of the circulatory organs in air-breathing vertebrates. Among annelids, arthropods, and molluscs the blood flows directly from the heart to all parts of the body, whence it is gathered into trunks which carry it to the gills; from these organs it is then returned purified to the heart. In the fishes the blood passes from the heart directly to the gills, whence it is gathered into the dorsal aorta and distributed to all parts of the body; it is then returned laden with waste product from the tissues to the heart. In these animals the heart consists of a single auricle and ventricle, essentially a simple tube more or less bent upon itself. In air-breathing amphibia a part of the blood passes directly from the heart to the lungs, whence it returns to the heart oxygenated, while a part of it goes at once to the body; the former is known as the pulmonary, the latter as the systemic circulation. In these animals the heart is incompletely divided by a partition which separates the auricular chamber into two auricles, but which leaves the ventricle undivided. The blood returning from the body is carried into the right auricle, while that from the lungs goes into the left; in the ventricle both kinds of blood mingle to a certain extent, though by a peculiar arrangement of folds and valves the larger part of the oxygenated blood which enters the left auricle is pumped to the anterior part of the body, while the blood from the right auricle goes to the lungs. Finally in all birds and mammals and in the highest reptiles (*Crocodilia*) the heart is completely divided by a partition into two auricles and two ventricles, and a double circulation, systemic and pulmonary, is established. The blood from the left ventricle goes at once to all parts of the body, whence it returns to the right auricle; it then falls into the right ventricle and is pumped from that to the lungs; here it is oxygenated and returns to the left auricle, and then from the left ventricle is again sent out to all parts of the body.

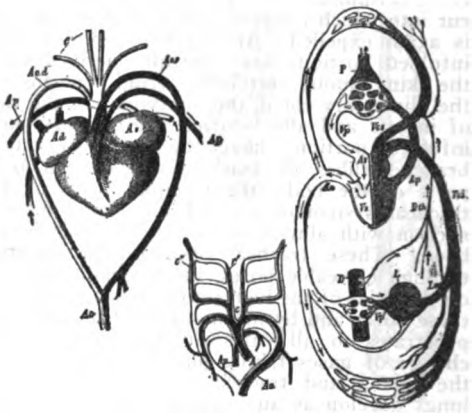


FIG. 13 FIG. 14 FIG. 15

FIG. 13.— Heart and great blood-vessels of the turtle (from Claus).— *Ad*, right auricle; *As*, left auricle; *Ao. d*, right arch of the aorta; *Ao. s*, left arch of the aorta; *Ao*, dorsal aorta; *C*, carotids; *Ap*, pulmonary arteries.

FIG. 14.— Aortic arches of a mammal, and their relations to the five embryonic arches (from Claus).— *c*, *c'*, carotids; *A*, aorta; *Ap*, pulmonary artery; *Aa*, great arch of aorta.

FIG. 15.— Diagram of a heart completely divided into right and left halves, and of a double (systematic and pulmonary) circulation (from Claus).— *Ad*, right auricle; *Vcs*, anterior vena cava; *Vci*, posterior vena cava; *Vd*, right ventricle; *Ap*, pulmonary artery; *P*, lung; *Vp*, pulmonary vein; *As*, left auricle; *Vs*, left ventricle *Ao*, aorta; *D*, gut; *L*, liver; *Vp*, portal vein; *Ls*, hepatic vein.

7. Excretory System.— Excretion is the process of removing non-gaseous waste products, particularly urea and allied compounds, from the body. These nitrogenous waste substances are formed as the result of proteid combustion within the body, and as this form of metabolism is universal among animals nitrogenous waste substances are everywhere formed. With few exceptions all animals pos-

sess some form of excretory organ; in fact this is one of the distinguishing characteristics of animals as contrasted with plants. Among the *Protozoa* the excretory organ is a pulsatile vacuole which gradually fills with fluid containing these waste products and then suddenly contracts, forcing this fluid out of the body. Among cœlenterates excretion is probably performed by isolated gland cells, so that no single organ exists for this function; even among higher animals excretion is performed to a limited extent by individual cells or small glands; for example, the chlorogogue cells of annelids, the dermal glands of *Crustacea* and the sweat-glands of mammals. In all higher animals a special excretory organ exists; this usually consists of minute tubules formed of cells which take up the waste substances and pass them into the tubule, whence they are carried to the exterior; such an excretory tubule is known by the general name of nephridium. The forms of nephridia differ considerably in different phyla, but two principal types may be recognized; these are the protonephridium, or water vascular system, and the metanephridium (Hatschek). The protonephridium is found in the flat worms and rotifers; that is, among worm-like animals without a secondary body cavity; it is also found as the larval excretory organ (head kidney) in annelids. It consists of a pair of more or less branched tubules opening at one or more places to the exterior, while the internal terminations of the tubules each end in a single large cell which closes the end of the tubule and bears a tuft of long cilia projecting into its lumen. This tuft beats with undulatory movement and looks somewhat like the flickering flame of a candle, whence it is called a "flame" and the large cell which bears it a "flame cell." The tubule itself is usually composed of a single series of long glandular cells so perforated that the lumen is intracellular. In larger branches of the protonephridium the walls of the tubule may be formed of

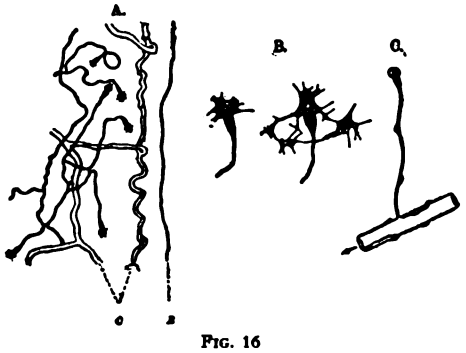


FIG. 16

FIG. 16.— Structure of the protonephridium (excretory organ) of a flatworm (from Hatschek).— *A*, part of the excretory apparatus of a tapeworm; E, edge of body; C, collecting tubules.— *B*. Terminal cells with flame of cilia.— *C*. Diagram of terminal cell, excretory capillary, and canal.

many cells which are ciliated on the side next the lumen. These cilia as well as the flame drive fluids within the lumen to the exterior. It is probable that these fluids are transuded body fluids and that the excretion of the waste substances is brought about by the activity of the cells which form the walls of the lumen.

The metanephridium is found among annelids, molluscs, molluscoids, prototracheates, and chordates, while a modified form of its exists in crustaceans. Typically it consists of a tubule opening to the exterior at one end and into the body cavity or some portion of it (pericardium or blood sinus) at the other. Where it opens

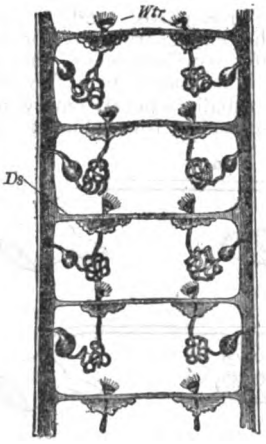


FIG. 17

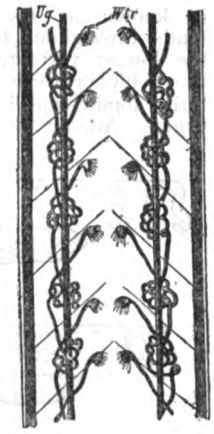


FIG. 18

FIGS. 17, 18.— Diagrams of the excretory system in an annelid and in a shark (from Claus after Semper).— *Ds*, dissepiments; *Wtr*, ciliated funnels; *Ug*, segmental duct.

into the body cavity the tubule is widened and covered with long cilia and is known as the ciliated funnel or nephrostome. Following this is the glandular portion of the tubule, consisting of a single series of perforated cells, or in other cases of an epithelium, composed of many cells, which forms the walls of the lumen. In either case these cells are glandular in character and are the real excretory cells, taking urea from the blood and passing it into the lumen of the tubule. The latter is ciliated throughout, and by the action of these cilia, together with those of the ciliated funnel, cœlomic fluid is drawn into the tubule through the funnel and driven to the exterior, thus flushing the tubule and carrying away the excreted substances. Finally the terminal portion of the tubule, which is derived as an invagination from the ectoderm, serves as a collecting tube or reservoir. Generally a single pair of these tubules is found in unsegmented animals, such as *Mollusca* and *Molluscoidea;* this number may be reduced, however, as in the *Polyzoa*, where they are entirely lacking, or in certain *Gasteropoda*, where one of them is suppressed, or it may be increased as in the case of certain *Cephalopoda* (*Tetrabranchia*), where two pairs are present. In segmented animals, such as annelids, prototracheates, and chordates, it is probable that originally one pair existed in every somite, and this is still approximately the case in some of the simplest members of these phyla, while in higher forms they are limited to certain segments and have disappeared from others. The segmental character of these organs is so characteristic in the phyla named that they are called "segmental organs."

Among the *Chordata* these organs undergo modifications which deserve especial mention. They lie at the dorsal side of the body cavity

and on each side of the notochord. Only in *Amphioxus* do they open individually to the exterior; in other chordates the peripheral ends of the tubules unite on each side into a duct which grows backward and opens into the cloaca near the anus; this is the segmental or Wolffian duct. This earliest system of segmental tubules in chordates is known as the pronephros, and it extends throughout the entire trunk region of the lowest vertebrates (cyclostomes), though in all higher forms it is limited to a few anterior somites and is usually a purely embryonic organ. Among these higher forms longer and

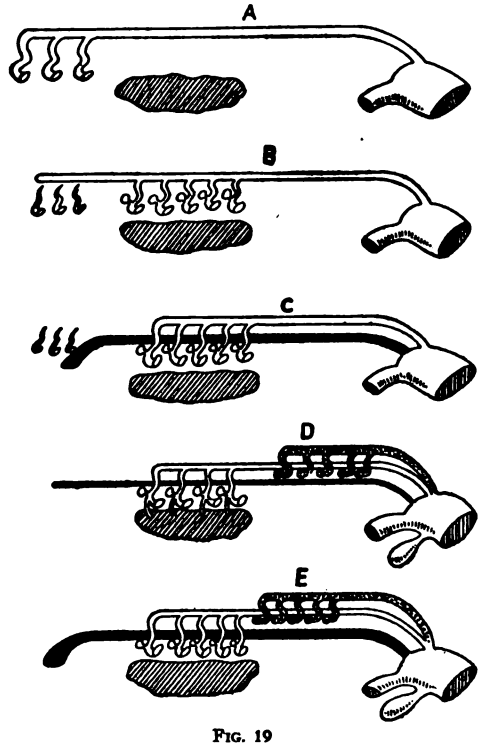


FIG. 19

FIG. 19.— Diagrams illustrating the development of the urino-genital organs of a vertebrate (after Parker and Haswell).— *A*, pronephros and segmental duct; *B*, atrophy of pronephros, development of mesonephros; *C*, appearance of Müllerian duct; *D*, development of metanephros, male type; *E*, the same, female type. The sex gland, ovary, or testis is obliquely shaded; phonephros and mesonephros unshaded; metanephros stippled; Müllerian duct heavily shaded. The large chamber to the right, into which these ducts as well as the intestine open, is the cloaca.

more complicated tubules are formed in the somites behind the pronephros, which also open into the segmental duct at one end and into the body cavity at the other; near the ciliated funnel a knot of blood vessels forms on the side of the tubule and projects into its lumen; this is the glomerulus or Malpighian corpuscle. Many of the tubules in this region then lose their ciliated funnels and no longer open into the body cavity, the tubule being flushed out by transuded plasma from the glomerulus; at the same time the single pair of tubules originally present in each somite may give rise to others by budding, so that several may be found in each somite. This second form of the nephridial system of vertebrates is known as the mesonephros, and is the permanent excretory organ of fishes and amphibians, while only an embryonic organ in reptiles, birds, and mammals. Finally, in the last named classes, the definite kidney or metanephros appears in several of the somites posterior to the mesonephros. Its tubules, while similar to those of the mesonephros, are still more complex, having no trace of a ciliated funnel, and by budding very many of them are formed in each somite. The duct into which they open, the ureter, is an outgrowth of the segmental duct. It is thus to be seen that the very complex excretory system of vertebrates can be derived, step by step, from the simple nephridial system of such invertebrates as the annelids.

Finally, the nephrida may carry off from the body cavity not only cœlomic fluid, but also cells which are set free into this fluid; some of these cells in the annelids may be loaded with urates which are thus carried to the exterior (chlorogogue cells), but the most important of the cells which thus escape from the cœlom are the sex cells, ova and spermatozoa. The nephridia may be especially modified for carrying off these sex cells, in which case they are known as gonoducts. Even among vertebrates the oviducts and spermiducts (*vasa deferentia*) may be derived from the nephric system. The former in some vertebrates arises in the embryo as part of the segmental duct and opens into the body cavity at its anterior end through a pronephric tubule; in animals above the amphibians, which have a metanephros and ureter, the segmental duct serves exclusively as a spermiduct in the adult.

8. *Reproductive System.*— Reproduction among animals is both sexual and asexual; the former occurs among all animals, the latter is limited to the lower forms and to the constituent cells of higher ones. Sexual reproduction or amphigony consists in the union of two cells, the sex cells or gametes, to form a single cell of double origin, the oosperm or zygote, from which a new individual similar to the parental form develops. If the gametes are approximately equal in form and size their union is spoken of as conjugation, if they are very unlike in these respects they are called ova and spermatozoa, and their union is known as fertilization. Both conjugation and fertilization occur among the *Protozoa*, whereas all *Metazoa* reproduce by means of differentiated sex cells, namely, ova and spermatozoa. In a few animals ova have the power of developing without previous fertilization, the process being known as parthenogenesis. If such development without fertilization occurs in larval forms which have not completed their development it is known as pædogenesis. In most animals the sexes are separate,— that is, ova and spermatozoa are produced by different individuals, males and females, and the species is dicœcious; in some cases, however, both kinds of sex cells are produced by the same individual, which is then said to be hermaphrodite, and the species to be moncœcious.

The essential reproductive organs are the gonads, or the glands which produce ova and spermatozoa, namely, the ovaries and the testes. In sponges the reproductive cells are scattered

through the mesoderm so that in these animals ovaries and testes cannot be said to exist. In the lowest cnidarians (*Hydrozoa*) the sex cells are at first widely scattered in the ectodermal epithelium, but they actively migrate to certain portions of the hydroid stem where reproductive buds are being formed, and, aggregating here, form gonads. In all higher animals definite gonads are present. No genital ducts are present in the cœlenterates, and none are needed, since the sex cells can escape directly into the water. In animals above the cœlenterates the sex cells are mesodermal in origin, and in most cases form a part of the epithelium lining the cœlom. In animals without a true cœlom the sex cells arise within tubes or glands the cavities of which may perhaps represent the cœlom. In flatworms the gonads occur in considerable numbers in a single individual. In roundworms they are limited to one or two tubes, in rotifers, molluscs, molluscoids, and echinoderms they are confined to one or at most a few sex glands, while in segmented animals they are found in primitive forms in every body somite, though with advancing organization they become limited to a few segments or even to one. In most animals above the cœlenterates some form of duct exists for carrying the sex cells to the exterior; among the flatworms, roundworms, and rotifers these ducts are never the excretory tubules, though they may possibly represent the cœlom of higher animals. In these higher forms they are frequently metanephridia, or modified excretory ducts.

In many animals the ova and spermatozoa escape directly into the water, and there the eggs are fertilized and undergo development; it is probable that in these animals the escape of ova stimulates the males to eject spermatozoa so that both kinds of sex cells are shed at about the same time. In such cases enormous numbers of sex cells are produced and very many are wasted. A slight advance over this condition is found in those animals (frogs, bony fishes, etc.) in which the openings of the male and female ducts are placed close together at the time of shedding the sex cells; this is known as external copulation. In other cases the spermatozoa only escape from the body, and by means of currents of water they are carried into the body of the female, where they fertilize the ova *in situ*, as in sponges, or in certain receptacles into which the eggs are collected, as in fresh-water mussels. In other animals copulatory organs exist which serve to introduce spermatozoa into the sex ducts of the female, thus increasing the chances for the fertilization of the ova; this is internal copulation. In many cases copulation occurs but once, and the spermatozoa are stored in a seminal receptacle which opens into or near the oviduct. Internal copulation is a necessity in all land animals and in parasites, and it also occurs in many phyla of invertebrates (flatworms, roundworms, rotifers, gasteropods, cephalopods, annelids, arthopods).

In certain animals the sexes differ not only with respect to the sexual apparatus but also in many other regards; when such differences are very marked they constitute what is known as sexual dimorphism. In such cases the male is frequently very degenerate in form, being sometimes not more than a hundredth part the size of the female and entirely lacking alimentary canal, sense organs and nervous system (rudimentary males of rotifers, barnacles, etc.).

Asexual reproduction, or monogony, consists in the formation of new individuals by division of an old one. In one-celled organisms and in the constituent cells of higher animals this takes the form of cell division. In the lower *Metazoa* asexual reproduction is not limited to cell division, but the entire body or portions of it may undergo constriction and subsequent division, thus giving rise to new individuals. This division may be into equal parts, in which case it is called fission; or into unequal parts, when it is known as budding or gemmation. In animals which reproduce both sexually and asexually there is a more or less regular alternation of one method with the other; this is known as alternation of generations (q.v.) or metagenesis. The alternation of amphigony with parthenogenesis is called heterogony.

9. *Nervous System and Sense Organs.*— Sensation and co-ordination are manifestations of protoplasmic irritability, or that capacity of receiving and responding to stimuli characteristic of every cell. Animals, even the simplest, are sensitive to a variety of stimuli, among which may be mentioned mechanical, chemical, thermal, and electrical, as well as light, gravity, etc. These stimuli, acting on the organism, start changes in the protoplasm (impulses) which are transmitted to portions of the body distant from the point first stimulated and call forth the co-ordinated activities of many different parts. In higher animals there are special sense organs for receiving certain of these stimuli and specialized protoplasmic fibres (nerve fibres) for transmitting impulses, while nerve centres for co-ordinating activities appear very far down in the animal scale. In the lowest animals, however, there are neither nervous system nor sense organs, and yet through the irritability of the general protoplasm these functions are performed.

A protozoan reacts to all stimuli in the same way, and it is probable that however different the stimuli may be they produce essentially the same changes in the protoplasm. The sensations of *Protozoa*, if they can be said to have sensations, must be of the most general and indefinite sort, just as their responses to stimuli show the most monotonous sameness. The same thing is probably true of sponges, where none of the cells are differentiated for receiving and transmitting stimuli. In all other phyla, however, certain cells of the body are set apart for these particular functions, and the greater the differentiation in these respects the more definite and varied are the sensations, the more swiftly impulses are transmitted to the motor system and the more complicated are the responses.

Nervous System.— The elements out of which the nervous system is built are nerve cells and fibres, the latter being merely outgrowths of the former. In practically all *Metazoa* these cells are derived from ectoderm, and in a good many animals the sense organs and entire nervous system remain throughout life a part of the superficial epithelium which covers the body (*Cœlenterata, Chætognatha,* certain *Annelida, Molluscoidea,* many *Echinodermata, Balanoglossus*); such a nervous system is said to be epithelial. In all other *Metazoa* the nerv-

ous system, though formed from epithelium, separates from it in the process of development, so that brain, ganglia, and nerve trunks come to lie some distance from the surface of

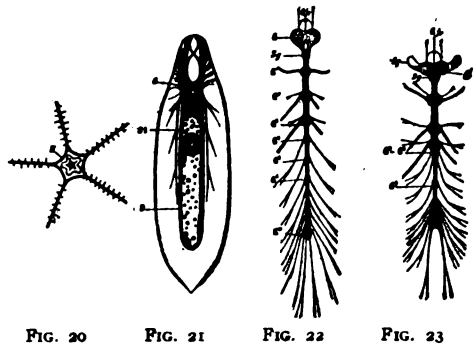


FIG. 20 FIG. 21 FIG. 22 FIG. 23

FIG. 20.— Diagram of the nervous system of a starfish (from Claus).— *N*, nerve ring.

FIG. 21.— Nervous system of a flatworm (*Mesostomum*).— *G*, cerebral ganglia and eyes; *St*, the two lateral nerve trunks; *D*, intestine with mouth.

FIG. 22.— Nervous system of the larva of a ladybug (*Coccinella*).— *Gfr*, frontal ganglion; *G*, cerebral ganglia; *Sg*, subœsophageal ganglion; *G'—G"*, ganglia of the ventral chain.

FIG. 23.— Nervous system of adult ladybug.— *Ag*, optic ganglion.

the body; this is known as an epitheliogenous nervous system. In addition to the two classes just mentioned, which are based on the relations of the nerve cells to the body layers, four types of nervous system are found among *Metazoa* which are based upon the relations of

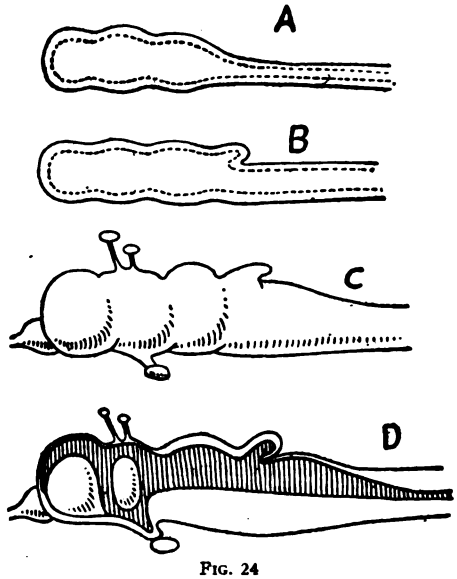


FIG. 24

FIG. 24.— Diagrams of the vertebrate brain (after Parker and Haswell).— *A*, first stage, with three brain vesicles; *B*, second stage, four brain vesicles; *C*, *D*, side view and sagittal section of fully formed brain without cerebral hemispheres.

the nerve cells to one another; these are (1) the diffuse type, (2) the linear type, (3) the ganglionic type and (4) the tubular type.

(1) A diffuse nervous system consisting of nerve cells and fibres scattered throughout the superficial epithelium is the simplest type known and is found among such animals as sea-anemones (*Actinozoa*); the nerve cells are here connected together by means of the fibres into a ganglionic plexus. (2) The next step in increasing complexity is represented by a linear nervous system such as is found in the jellyfishes; here many nerve cells and fibres are aggregated into a double nerve ring around the margin of the umbrella, thus forming a centralized nervous system; other nerve cells remaining, scattered throughout the epithelium, serve to connect the ganglia with the muscles. (3) The ganglionic type. In ctenophores, a sense organ from which nerves radiate, is found at the apical pole, and in a great many of the higher animals the earliest formed and most widely represented portion of the nervous system is a sense organ and ganglion which appear at the apical pole of the gastrula, and

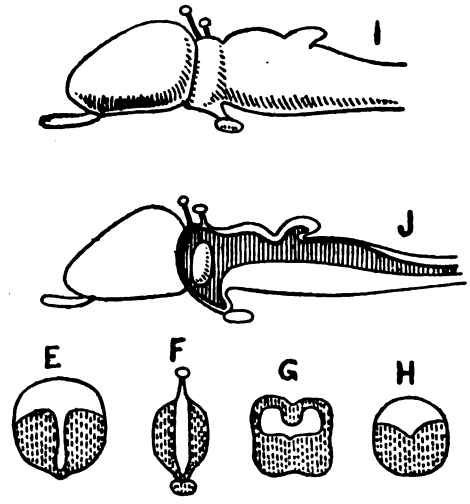


FIG. 25

FIG. 25.— Diagrams of vertebrate brain (after Parker and Haswell).— *E* — *H*, transverse sections of brain at different levels; *E*, of the cerebrum; *F*, of the 'tween brain; *G*, of the mid brain; *H*, of the hind brain; *I*, *J*, side view and sagittal section of a brain with cerebral hemispheres.

becomes in the adult the cerebral ganglion or brain, lying on the dorsal side of the œsophagus. Nerve trunks are always given off from this ganglion, and very generally two of them run down on each side of the œsophagus to its ventral side, thus forming a circumœsophageal nerve ring. In different phyla longitudinal nerve trunks may be given off from different parts of this ring; among annelids, arthropods, mollusks, and molluscoids from the ventral side, and in annelids and arthropods this forms the «ventral chain,» which consists typically of a pair of ganglia in each somite connected with those in front and behind by nerve cords. The first one in the chain is the subœsophageal ganglion, connected with the cerebral ganglion by the circumœsophageal commissures. In the mollusks the nervous system consists of a pair of supra- and sub-œsophageal ganglia (cerebral and pedal) which with their connectives form an œsophageal

ring. To these is usually added a pair of pleural and of parietal ganglia forming a loop, which extend back into the body, while ventral trunks (pedal cords) may be present in the foot. (4) The tubular type of nervous system is found only among the chordates; here the nervous system develops from an epithelial plate (neural plate) on the dorsal surface of the embryo, which becomes invaginated in such a way as to form a longitudinal groove, the neural groove. This then separates from the

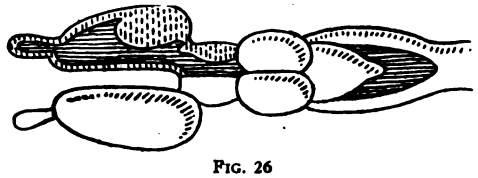


FIG. 26

FIG. 26.— Dorsal view of vertebrate brain with the cavities of the right side exposed (after Parker and Haswell).

epithelium as a tube, which in all vertebrates is enlarged at its anterior end to form the brain. This neural tube, while apparently a continuous structure, is really composed of segments, the neuromeres, one neuromere being found in each body somite; the neuromeres are thus comparable to the ganglia of the ventral chain of arthropods and annelids. This segmentation of the central nervous system of vertebrates is indicated even in the adult by the segmental arrangement of the spinal and cranial nerves. In the embryonic development of all vertebrates the brain consists of three enlargements or vesicles, the fore brain, mid brain and hind brain; the first gives rise to the cerebrum and 'tween brain of the adult, the second remains as the mid brain, while the third gives rise to the cerebellum and medulla. The portion of the neural tube posterior to the brain becomes the spinal cord of the adult. With the differentiation of nerve cells and fibres in the walls of the neural tube these walls increase greatly in thickness, while the originally large cavity of the tube becomes restricted in size, forming in the adult the ventricles of the brain and the central canal of the cord.

Sense Organs.— The simplest sense organs are the scattered sensory cells found in the superficial epithelium of many animals; these may be solitary or aggregated into buds. They are elongated epithelial cells with a hairlike process at the free border and a fibre at the deeper end connecting with the branches of a ganglion cell. They are organs of general sensation — that is, they are capable of receiving various kinds of stimuli, such as mechanical, thermal, electrical, and chemical, and are therefore largely undifferentiated, though probably chiefly subserving the sense of touch. These integumentary sense organs are found in almost every group of animals. Among the vertebrates they are present in primitive form over the general body surface; in the fishes and amphibia they are aggregated into buds, forming the lateral line organs, while among those vertebrates which do not dwell in water deeperlying organs, of modified type, are found (tactile cells, corpuscles, and bulbs). In addition to these organs of general sensation, higher *Metazoa* generally possess specific sense organs, namely, those differentiated for the reception of particular kinds of stimuli. These are organs of (1) smell and taste, (2) equilibrium and hearing, (3) vision.

(1) Organs of smell and taste are present in all vertebrates and in many invertebrates. Their structure is extremely simple, being but slightly modified from the type of the primitive organs described above. In fact the olfactory sense cells of vertebrates are merely scattered sensory cells, while the organs of taste (taste buds) are simple aggregations of such cells. Throughout the *Metazoa* the organs of taste and smell are generally located in ciliated pits or depressions of the integument either on the head or at least near the mouth or respiratory organs. In these positions they serve in the one case to test food and in the other the quality of the medium used in respiration. Among fishes the olfactory organs are located in pits on the front of the head; in all air-

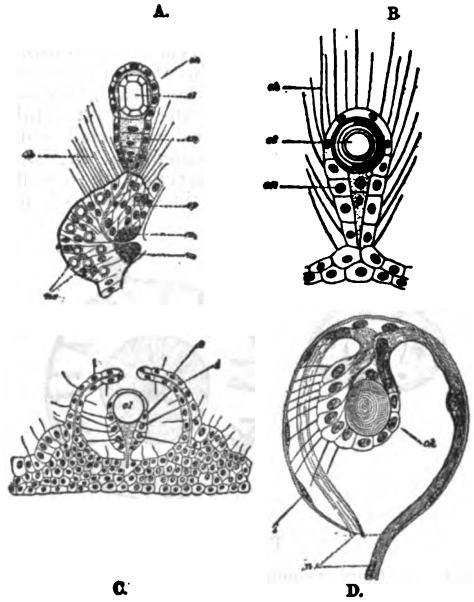


FIG. 27

FIG. 27.— Auditory or equilibrative organs of jelly-fishes (from Hatschek).— *A*, of *Cunarcha*. *B*, of *Pectis*. *C*, of *Rhopalonema*. *D*, of *Cumarina*. *Ok*, auditory tentacle; *Ol*, Otolith; *Oh*, auditory hairs; *n*, nerve.

breathing vertebrates these open posteriorly into the mouth cavity or pharynx, and thus form the anterior part of the respiratory tract. The organs of taste are of course in or near the mouth. Among the molluscs a sense organ which is probably olfactory in function, the osphradium, is located near the gills. Among the arthropods we find notable modifications of these organs owing to the fact that the entire body surface is there covered with an impermeable chitinous coat. These sense organs are here peculiar hollow tubes, the olfactory tubes or cones, which are borne on the anterior portion of the body, usually on the antennæ and mouth parts; these hairs are filled with fibrillar protoplasm which connects with sense cells at the base of the hair.

(2) Organs of hearing and equilibration are very widely represented throughout the animal kingdom. It is advisable to consider these two

organ systems together, since the two functions which they subserve are united in the same general organ in the vertebrates, while in lower forms it is by no means easy to distinguish between the two. It has long been customary to speak of all vesicular sense organs containing free solid bodies as auditory in function, but it is much more likely that in the lower *Metazoa* they serve to acquaint the animal with its bodily positions — that is, that they are organs of equilibration. In many respects the simplest type of organ of this class is found among certain jellyfishes. It here consists of a short tentacle situated in a depression of the ectoderm and bearing a solid body or otolith near its free end; by the movements of the tentacle the hairs or protoplasmic processes of surrounding sensory cells are stimulated. In other *Medusæ* the sensory cells may entirely enclose the tentacle, thus forming an auditory vesicle or otocyst. The auditory organs of most vertebrates, as well as of most invertebrates, can be traced back to this simple type. The sensory cells forming the walls of the otocyst are similar to tactile cells — that is, they bear processes projecting into the cavity of the otocyst, while the bases of these cells are connected with ganglion cells. By the movements of the otolith, usually a calcareous concretion, these cells are stimulated and impulses thus generated are

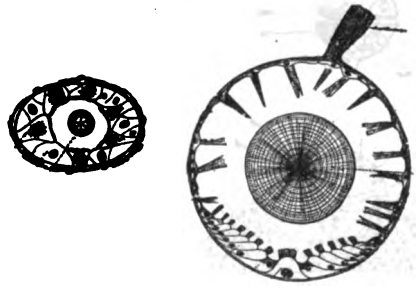


FIG. 28

FIG. 28.— Auditory or equilibrative organs of molluscs (from Hatschek).

conveyed away by the nerve fibre. Otocysts of this type are possessed by molluscs, certain annelids, tubellarians, and brachiopods. In the case of arthropods organs of a different type are generally found, owing to the fact that the body is here covered by chitin and that the fine protoplasmic processes or cilia are absent. Among the crustaceans the auditory organ usually consists of a cavity in the basal joint of the first antenna, which is open to the exterior and which contains water and grains of sand; the wall of the cavity bears chitinous processes or auditory hairs which have a nervous connection at their base; these hairs are stimulated by the movements of the water and sand within the auditory sac. Many insects have a true tone-perceiving organ, the chordotonal organ; in principle this consists of a few elongated cells, the chord, which are attached directly to the integument at one end and by a ligament to an opposite point of the integument; when this apparatus is thrown into vibration impulses are conveyed to the nerve cells attached to some portion of the chord. In other insects (*Orthoptera*) a tympanal organ may be present, consisting of a vibrating membrane overlying a tracheal chamber; sense cells are present between the membrane and chamber, and when the membrane is set into vibration

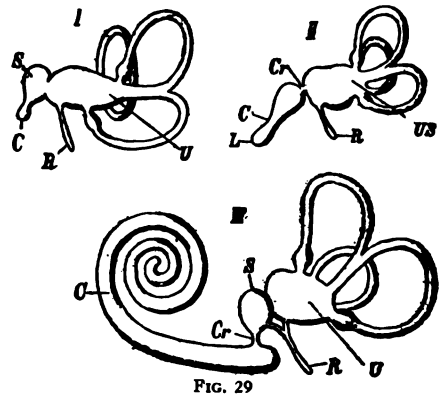


FIG. 29

FIG. 29.— Internal ear of different vertebrates. I, Fishes. II, Birds. III, Mammals. (From Claus.)— *U*, utriculus with semicircular canals; *S*, sacculus; *Us*, utriculus and sacculus; *C*, cochlear duct; *L*, lagena; *Cr*, *canalis reuniens*; *R*, *recessus vestibuli*.

by sound waves the sense cells are stimulated. Among aquatic vertebrates a system of integumentary sense buds is found along the lateral borders of the body and over the head, which is known as the lateral line system. The function of these organs is not surely known, but it is probable that they are organs of touch and also of equilibration. In all vertebrates it is probable that the auditory organs, as well as the organs of smell and taste, have been derived from integumentary sense organs homologus with those of the lateral line. In the process of development the ear appears as a pit-like invagination of the skin which is then infolded to form a vesicle; this vesicle then becoming partially divided into two chambers, the utricle and the saccule. In most vertebrates the former bears three pairs of semicircular canals which are organs of equilibration, while the latter gives rise to a recess, the lagena, which becomes the cochlear duct in mammals and is a true auditory organ. Calcareous concretions or otoliths are present in

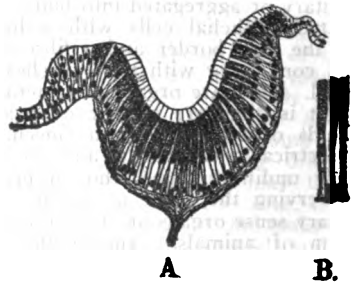


FIG. 30

FIG. 30.— *A*, section through the open eye-pit of a limpet (*Patella*); *B*, the two kinds of retinal cells, pigmented and sensory (from Hatschek).

this much-folded and complicated otocyst. This sensory portion of the auditory organ is known as the inner ear; to this is added in all animals above the frogs and toads a middle ear or tym-

panum which transmits the sound waves from the surface to the inner ear. Finally, in the mammals there are folds of the integument around the tympanic membrane which serve to collect sound waves and which constitute the external ear.

(3) *Visual Organs.*— Animals without any trace of eyes are sensitive to light (certain

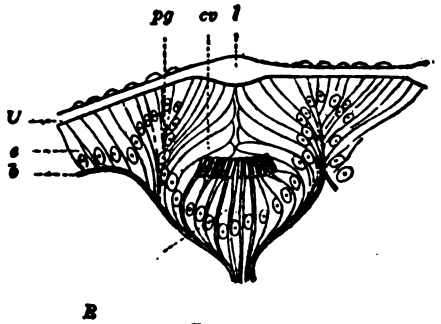


FIG. 31

FIG. 31.— Section through the eye of a water-beetle (*Hydrophilus*) (from Hatschek); *l*, chitinous lens; *cv*, transparent cells; *pg*, pigment cells; *R*, retina.

Protozoa, Turbellaria, Larvæ), and it must therefore be assumed that protoplasm may be directly stimulated by light without the intervention of any special organ. In its simplest form an eye consists of one or a few transparent cells partially surrounded by pigment in the form of a cup, so that the light can enter only from one side; the pigment not only absorbs light rays, but it optically isolates the

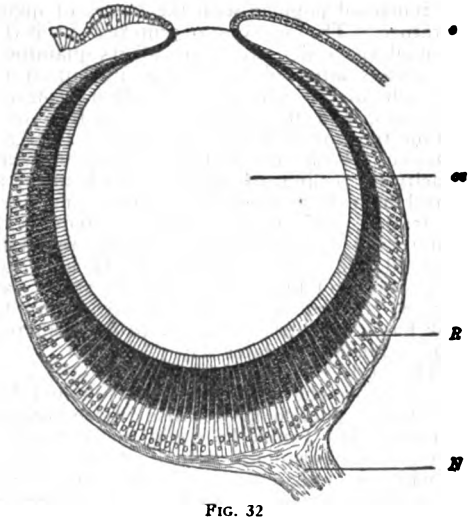


FIG. 32

FIG. 32.— Section through the cup-shaped eye of a gasteropod (*Haliotis*) (from Hatschek).— *e*, epithelium covering body; *cv*, vitreous body; *R*, retina; *N*, nerve.

cells within from those without this cup (some *Medusæ, Turbellaria, Annelidæ*). The function of such an eye is probably to determine the direction of light, since it could give no image of luminous objects. A slight advance over this simplest type of eye is found in the cup-shaped eyes of certain mollusks; here certain superficial epithelial cells are infolded to form a cup; in some cases deeply pigmented, while other intermediate cells remain clear and unpigmented. The latter are the sensory cells and are connected at their bases with nerve fibres. If this cup-shaped eye becomes infolded still further and its opening grows smaller and finally closes altogether, it forms a vesicular eye such as is present in certain molluscs and annelids. The wall of this vesicle, which is turned toward the surface, is transparent and may become thickened to form a lens; the opposite wall of the vesicle is pigmented and is known as the retina. In such an eye the free ends of the retinal cells are turned toward the cavity of the vesicle, while the opposite ends, which are directed away from the vesicle,

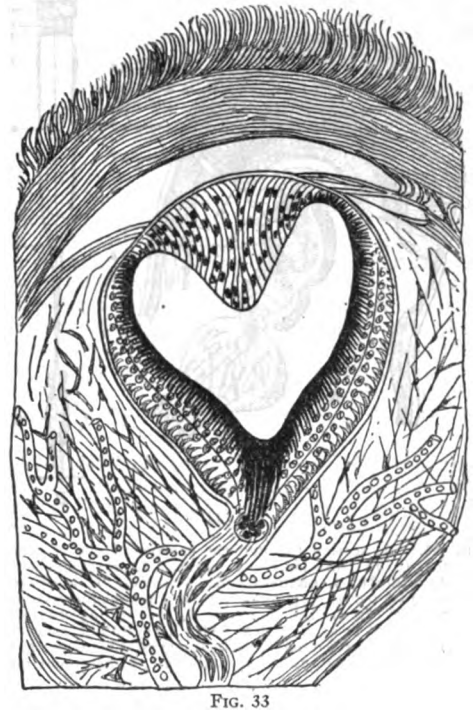


FIG. 33

FIG. 33.— Longitudinal section through the pineal eye of a lizard (*Sphenodon*) (after Baldwin Spencer). The eye is located in the middle of the dorsal side of the head and is covered by translucent scales. The outer wall of the eye vesicle is thickened to form a lens, while the inner pigmented wall is the retina from which the nerve proceeds.

are prolonged into fibres; such an eye has a direct retina. This type of eye reaches its highest development among the cephalopods, where it bears a striking superficial resemblance to the vertebrate eye. A rudimentary eye of this type is present in all vertebrates as the pineal organ or gland. This is an unpaired structure on the dorsal side of the 'tween brain and in certain reptiles is plainly a vesicular eye with direct retina. The paired eyes of vertebrates are also vesicular, but in them the retina is inverse — that is, the free ends of the retinal cells are directed away from the cavity of the vesicle, while the ends which bear the fibres are directed toward it. The explanation of this remarkable condition is found in the study of the development of these eyes. They arise as

lateral evaginations of the walls of the embryonic fore brain, are then constricted from the brain, and become vesicles connected with the fore brain by only a stalk. At this stage the vertebrate eye is like the invertebrate one save only that it has arisen from the neural instead of the superficial epithelium. All the cells which form the vesicle have their free ends directed toward its cavity, while their basal ends are directed away from it. The outer wall of this optic vesicle is then infolded until it comes into contact with the inner wall, thus forming a cup open toward the skin. The ectoderm over the opening of the optic cup is then infolded to form the lens, which completely separates from the surface and lies in

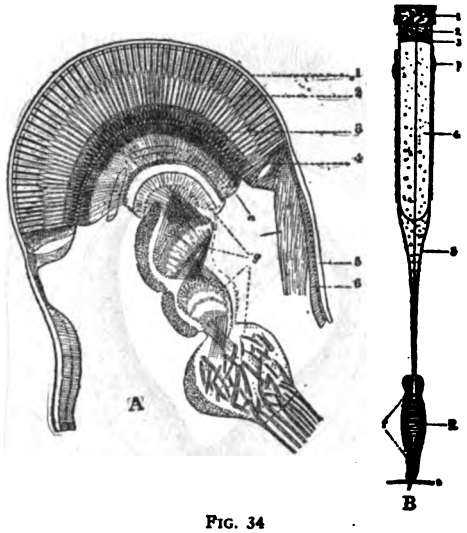


FIG. 34

FIG. 34.— *A*, section through the compound eye of a crayfish (from Hatschek).— 1, cornea; 2, crystalline cones; 3, retinulæ; 4, pigment cells; 5, cuticle; 6, epithelium; *n*, optic nerve; *g*, ganglia. *B*, A single element (ommatidium) from the compound eye of a crayfish.— 1, corneal lens; 2, corneal cells; 3, crystalline cone cells; 4, 5, outer and inner parts of the crystalline cone; *p*, pigment cells; *r*, retinula; *R*, rhabdome; *b*, basement membrane.

the mouth of the cup. The infolded wall of the cup alone forms the retina, and therefore the free ends of the retinal cells are directed away from the lens and the cavity of the cup. The optic cup with the lens is then surrounded by an outer fibrous and an inner vascular coat, the sclerotic and choroid; a chamber is formed in front of the lens which is filled with water or aqueous humor, while one behind the lens and in front of the retina is filled with vitreous humor.

The compound eye is another type found chiefly among arthropods. It consists of a large number of closely-packed single eyes or ommatidia, each of which is surrounded by pigment and is optically isolated from the others. Each ommatidium consists of (1) a hexagonal cornea at the surface, (2) a crystalline cone below this, and (3) the retinula or group of retinal cells which are connected with nerve fibres.

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EDWIN GRANT CONKLIN,
Professor of Zoology, Princeton University.

ANATOMY OF MELANCHOLY, The. Robert Burton spent all his mature life at Oxford in scholarly retirement. He was a library student, not a man of affairs, and not a practical physician but a divine. He conceived of his subject in his 'Anatomy [i.e. analysis of] Melancholy' as a malady of both soul and body, and he busied himself with writing his book, so he says, to cure himself of melancholy, one of the chief causes of which he declared to be idleness. The book was a serious effort, carefully planned in its large outlines. But the main outline seems often forgotten, and is filled in with a great mass of various detail. The "roving humour" to which he confesses gave Burton an opportunity to provide a running commentary on men and morals, politics, religion, business, pleasure, love, and any other topics suggested to him by the books which he had "confusedly tumbled over." The book has been continuously read since the appearance of the first edition in 1621, and in a way has remained popular with the lovers of quaint literature. The sources of interest in it for the modern reader are above all its quaintness, not always intended by Burton, its out of the way scholarship which seems often grotesque nowadays, and its fidelity as a picture of a certain type of 17th century mind. It treats, moreover, with good humor and constant vivacity of feeling, of subjects which affect all mortal men, it abounds in anecdote and lively illustration, and, mixed with its credulity, it exhibits not a little skill in analyzing the states of mind and body of mankind. "I have laid myself open (I know it) in this treatise," says Burton, "turned my inside outward," and the book has not a little similarity to the numerous "confessions" of a later day.

The style of the 'Anatomy' is one of its most notable characteristics. Burton had first intended to publish his treatise "more contract in Latin," but found he could not get a long Latin book printed, though "any scurrile pamphlet is welcome to our mercenary Stationers in English." Perhaps it is fortunate that he did not find a willing publisher for the Latin version, for when he came to write in English he certainly spoke more from "the strings of his heart" than he would have done in writing a foreign idiom. He declared that he wrote "with as small deliberation as I do ordinarily speak, without all affectation of big words, fustian phrases, jingling terms, tropes, strong lines, that like Acestes' arrows caught fire as they flew, strains of wit, brave heats, elogies, hyperbolical exornations, elegancies, etc., which many so much affect. I am *aquæ*

potor, drink no wine at all, which so much improves our modern wits, a loose, plain, rude writer.» This passage, if it does not describe Burton's style adequately, illustrates at least some of its main features. It is not a neat and meticulous style, nor is it ornate and ingenious. It is rather an easy, discursive essay style, often elaborated until it attains a kind of robustious eloquence. It is characterized also by a monstrous heaping of citations and quotations, like a mediæval sermon, or as a modern scholarly dissertation would be if the footnotes were inserted in the body of the text. To read Burton with pleasure, one must regard these quotations as interruptions, not part of the rhythm of his phrasing. When they are omitted or are not present, the style moves along easily and rapidly, not unlike the style of one conversing with some degree of animation.

GEORGE PHILIP KRAPP,
Professor of English, Columbia University.

ANATOMY OF PLANTS. See PLANTS, STRUCTURE OF.

ANATTO. See ANNATTO.

AN'AXAG'ORAS, Greek philosopher: b. Clazomenæ, in Ionia, about 500 B.C.; d. in Lampsacus, about 428. Settling at Athens, his pupils included Pericles, Euripides and Socrates. In middle life he was publicly charged with impiety and condemned to death, but the sentence was commuted to perpetual banishment. Anaxagoras held that there was an infinite number of different kinds of elementary atoms, and that these, in themselves motionless and originally existing in a state of chaos, were put in motion by an eternal, immaterial, spiritual, elementary being, from which motion the world was produced.

AN'AXAR'CHUS, a native of Abdera, who was a friend and counselor of Alexander. He was put to death by Nicocreon, Prince of Cyprios.

ANAX'IMAN'DER, Greek philosopher, mathematician and astronomer: b. in Miletus 611 B.C.; d. 547. The substance of his philosophical teaching is that the source of all things is an undefined substance infinite in quantity. According to his theory the universe is a series of concentric cylinders surrounding the cylindrical earth. Anaximander occupied himself much with mathematics and geography, and to him are ascribed the invention of geographical maps, the first application of the *gnomon* or style fixed on a horizontal plane to determine the solstices and equinoxes, and the discovery of the obliquity of the ecliptic.

ANAXIMENES, ăn'ăks-ĭm'ē-nēz, **OF LAMPSACUS,** Greek historian: b. Lampsacus, Asia Minor, about 340 B.C. To him is attributed the 'Ars Rhetorica ad Alexandrum' found among the writings of Aristotle. Only fragments of his histories of Philip of Macedon, Alexander, and Greece remain.

ANAXIMENES OF MILETUS, Greek philosopher: b. Miletus, and flourished about 550 B.C. He affirmed that air was the first principle of all things. Finite things were formed from the infinite air by compression and rarefaction produced by eternally existent motion; and heat and cold resulted from varying degrees of density of the primal element.

ANAYA, ä-nä'yȧ, **Pedro Maria,** Mexican commander: b. Huichapan 1795; d. 1854. Entering the army in 1811 he attained the rank of brigadier-general in 1833. He held several cabinet positions, was acting President of Mexico for a few weeks in 1847, and at the time of his death was Postmaster-General under Santa Anna.

ANCACHS, ąn-kächs', or **ANCASH,** Peru, a department bounded on the north and northeast by La Libertad, on the east by Huánuco and Junin, on the south by Lima and on the west by the Pacific Ocean. It is estimated to contain 16,562 square miles. The ports are Santa, Chimbote, Samanco, Casma, and Huarmei. The rivers rise on the western slopes of the Cordillera, with the exception of the Santa, which, rising east of the Cordillera, flows first through the valley of the Callejon of Huarás, but in the northern part of the department turns west, unites with the Chuquisaca and passes through a deep gorge in the Cordillera to the Pacific (compare observations on the Patia River, article COLOMBIA). Its total length is about 180 miles. The valley of the Santa is extremely fertile. It is connected with the port of Chimbote by a railway running as far as Tablones. The departmental capital is Huarás. Agricultural products are sugar, rice, cereals, grapes, maize and a special kind of potato (the Carás variety) which matures in three months. Among the mineral resources we note particularly the coal (bituminous generally, but anthracite near Chimbote and Huarás), petroleum, gold, copper, silver and lead. Pop. 317,000.

ANCÆUS, ăn-kē'us, the name of two of the Greek Argonauts, one the son of Poseidon and steersman of the Argo, the other a son of the Arcadian Lycurgus. Each was killed by a wild boar.

ANCELOT, ăns'lō', **Jacques Arsène François Polycarpe,** French novelist, dramatist and poet: b. Havre, 9 Feb. 1794; d. Paris, 7 Sept. 1854. His tragedy, 'Louis IX,' brought him a pension in 1819, but he lost it through the revolution of 1830. He produced pleasing verses, epigrammatic satires; an epic, 'Marie de Brabant' (1825); a novel, 'L'Homme du Monde' (1829), as well as other works, but 'Louis IX' remains his most important achievement. His wife, MARGUERITE VIRGINIE CHARDON, b. Dijon, 15 March 1792; d. Paris, 21 March 1875, wrote novels and plays sometimes with him, but also independently, and won some attention as an artist.

ANCESTOR, one who has preceded another in a direct line of descent; an ascendant, a former possessor; the person last seised. Termes de la Ley; 2 Shars. Bl. Com. 201. In the common law, the term is understood as well of the immediate parents as of those that are higher; as may appear by the statute 25 Edw. III, *De natis ultra mare,* by the statute 6 Rich. II c. 6, and by many others. But the civilians' relations in the ascending line, up to the great-grandfather's parents, and those above them, they term *majores,* which common lawyers aptly expound *antecessors* or ancestors, for in the descendants of like degree they are called *posteriores.* Cary, Litt. 45. The

term ancestor is applied to natural persons. The words predecessors and successors are used in respect to the persons composing a body corporate. Consult 2 Bl. Com. 209; Bacon, Abr.; Ayliffe, Pand. 58; Reeve, Descents.

ANCESTOR-WORSHIP. See MAN.

ANCHIETA, ăn-shyă-tà, **Jose de,** Portuguese missionary to Brazil: b. Laguna, Teneriffe, 1533; d. 1597. He was a Jesuit and founded in Brazil the first institution for the conversion of the inhabitants. He was the author of 'Natural Productions of Brazil.'

ANCHISAURUS, ăn'kĭ-sâ'rŭs, a carnivorous dinosaur of the Triassic period. It has many primitive characteristics, notably small size, four complete toes in the hind foot and five in the fore foot.

ANCHISES, ăn-ki'sēz, a legendary hero of Troy, to whom Venus, in the guise of a Phrygian shepherdess, bore a son, Æneas. At the burning of Troy Æneas carried his father away on his shoulders, and their voyage to Sicily is described in Virgil's 'Æneid.'

ANCHITHERIUM, ăn'ki-thē'rĭ-ŭm, one of the three-toed fossil horses of the Middle Miocene period. Its remains have been found in Europe and North America; a complete skeleton was uncovered at Pawnee Buttes, Col., in 1901 and is now on view in the American Museum of Natural History, New York. The animal was about the size of the Shetland pony; the middle toe of each foot was well developed; the lateral toes, one on each side of the middle toe, reached the ground, but were unable to support any weight owing to their delicate construction. It was formerly held that this animal was the ancestor of the modern horse, but it is now regarded as an offshoot from the main line of evolution of the horse. See also FOSSIL; HORSE.

ANCHOR, a heavy instrument of iron, intended to be dropped from a ship to the sea-bottom, to hold her in a desired position. It usually consists of a shank, having at one end a ring, to which the cable is fastened with a cross-piece or stock, and at the other end two arms with blades at the end, called flukes. In one form of anchor the stock is not a cross-piece in the sense of lying transversely to the direction of the arms, but lies in the same direction. In the Homeric times large stones were used for anchors; afterward they are said to have been sometimes of wood loaded with lead. In some places baskets full of stones or sacks filled with sand were employed for the same use. All these were let down by cords into the sea, and by their weight stayed the course of the ship. Among the Greeks of later times anchors were composed of iron. Sometimes there was only one tooth or fluke, but generally there were two. Anchors with two flukes appear from ancient monuments to have been much the same as those used at present, but the transverse piece of wood fastened to the shank (the stock) is wanting in all of them. Every ship had several anchors, one of which, surpassing all the rest in bigness and strength, was peculiarly termed, in Greek, *hiera,* and in Latin *sacra,* and was never used but in extreme danger; whence *sacram ancoram solvere* is proverbially applied to such as are forced to their last refuge. When an anchor of the usual form is let fall from the vessel, it generally strikes the bottom with the crown or curve of the arms, and then falls over on one of the ends of the stock, the arms lying flat on the ground. In this position it cannot bite, so that it has to be canted or turned over till the stock lies flat, and the point of one of the flukes (the bill or peak) rests on the ground. The canting is effected by the vessel pulling at the cable, and the longer the stock and the shorter the arms the less is the force required to perform the operation; for this reason the stock is always made longer than the arms. The anchor will now either drag or penetrate the ground, the readiness with which it does the latter depending on the sharpness of the bill, the angle at which the fluke rests on the ground and of course the nature of the bottom. Fortunately the arms used to be rigidly attached to the shank of the anchor; but in 1838 Mr. Porter took out a patent for an anchor of a new construction (though the principle was known before, however), in which the arms were movable around a pivot at the end of the shank, the plane of their movement being perpendicular to the direction of the stock. The advantages of this anchor are, that there is almost no possibility of fouling it — that is, of the cable becoming entangled with one of the arms; it cannot lodge on the stock end; it presents no upper fluke to injure the vessel to which it is attached, or others, in shoal water (since the swivel movement enables the peak of the upper fluke to come close to the shank when the anchor is fixed); it is not so liable to break, is more conveniently stowed on board, etc. This form of anchor as improved by Trotman is now largely used in the merchant service. In the navies both of Great Britain and of foreign countries the anchor perhaps most commonly employed is the admiralty anchor with fixed arms, the chief recommendation of which is the excellence of its proportions. Another favorite is Rodgers', the chief peculiarity of which is its small flukes. The inventor claims for this anchor that it holds the ground better than those with large flukes. Another excellent anchor is that patented by a Frenchman named Martin. In his anchor the stock lies in the same direction as the arms, the consequence of which is that when the anchor reaches the ground it inevitably falls flat, with both stock and arms resting on the bottom. The arms are capable of turning in a socket through an angle of 30° in such a manner that when the anchor is lying flat on the ground the flukes of both arms may sink into the ground at an angle of 15°. The weight of the arms and the pull of the vessel cause them to do this. It will be understood that the flukes are not, as in other anchors, perpendicular to the direction of the arms, but lie in the same direction. Besides holding the ground more firmly than any other anchor of equal weight, this anchor has the advantages of being free from liability to foul and easily stowed. The latter circumstance particularly recommends it for use in unmasted turret ships, almost all of which are equipped with it.

The different anchors carried by a ship are bower, sheet, stream, stern, and kedge anchors. The bower anchors are so called from their being stowed in the bow. When one bower an-

chor is heavier than the other it is called the best bower and is stowed on the starboard side. Sheet anchors are stowed in the waist of the ship as far forward as convenient. The stream anchor is used in a river or sheltered place where a large anchor is not required. The stern anchor is stowed in the stern, and is employed with a bower anchor where there is no room for a vessel to swing with the tide. The kedge anchor is used to warp a ship from place to place; that is, the anchor is carried to a distance in a boat, and the ship is then pulled up to it by means of the cable. A large iron-clad carries eight anchors: two bower, two sheet and two kedge anchors, with one stream and one stern anchor. The anchor is said to be a-peak when the cable is perpendicular between the hawse and the anchor; and to come home when it does not hold the ship. To shoe an anchor is to fix boards upon the flukes so that it may hold better in a soft bottom. Riding at anchor is the state of the vessel when moored by the anchor or anchors. Dropping or casting anchor is letting it down into the sea. Weighing anchor is raising it from the bottom. A mooring anchor is a stationary anchor in a harbor or roadstead, with a buoy attached to it by a cable, enabling a ship to moor by simply fastening itself to a ring-bolt on the buoy. These anchors should not project above the bottom, or the ship may receive injury by grounding on them. Mooring anchors are of various kinds, and in some cases a heavy block of stone or cast iron serves as such. One of the most powerful mooring anchors yet invented consists of a wrought-iron shaft with a pointed screw end, and near the lower end a cast-iron screw flange three and one-half feet in diameter. The anchor is screwed down into the solid ground, and its holding power is more than equal to that of a cast-iron anchor weighing seven tons. The making of anchors used to be a most formidable piece of smith work, but it has been much facilitated by the invention of the steam hammer. The shank of a large anchor, nearly 20 feet long and 10 or 12 inches thick, requires to be built up of a number of bars of iron which are then welded together. Crucible steel is now to some extent used for anchors.

ANCHORAGE, a suitable place for anchoring. A good anchorage should have a soft bottom and a depth of from 10 to 20 fathoms. When deeper than this the cable bears too nearly perpendicular and is apt to drag up the anchor. The length of cable paid out by a ship in anchoring in ordinary weather is about three times the depth of the water. Anchorage also means dues paid by a vessel anchoring. As a rule a ship sheltering from stress of weather and not discharging cargo at the place where it anchors is not required to pay dues, but shore-dues are payable whether a ship anchors or not.

ANCHORITE, ANCHORET or **ANACHORET**, one who has renounced the world and retired into a seclusion remote from inhabited places. The desire is not distinctively Christian; it manifests itself in all religions and in all ages. Anchorites of various Hindu ascetic sects are at present to be found among the jungles and hills of India, and the Orient has always been a land of them. The peculiarity of the ancient anchorites was that, though retiring for solitude to the wilderness, they lived there in fixed abodes, generally caves or hovels, in place of wandering about. When they did travel they slept wherever night overtook them, so that visitors might not know where to find them. They were most numerous in the Egyptian desert, where they lived on roots and plants, believing that to afflict the body was the best method of spiritually benefiting the soul. The most of them were laymen. There were also female anchorites. These first arose, it is said, about the middle of the 3d century; in the 7th the Church extended its control over them, ultimately throwing difficulties in the way of anyone who wished to adopt such a mode of life.

ANCHOVY, an-cho'vi (of uncertain origin, perhaps literally a dried or pickled fish, from Basque, *antzua*, dry), a small, richly flavored, herring-like fish (*Engraulis encrasicholus*), of the family *Engraulididæ*. It is caught abundantly along the sea-coasts of southern Europe when coming in from the deep sea to spawn in early summer. The Mediterranean fishers in particular salt and dry it in large quantities for export. Closely allied species are found on the eastern and western coast of America and off southern Asia. A Californian species (*Engraluis mordax*) is extremely abundant in large schools and is a valuable food fish. In general, anchovies are five to seven inches long, shaped like herrings, and have a pointed head and projecting upper jaw.

ANCHOVY-PEAR (*Grias cauliflora*), a tree of the family *Lecythidaceæ*, found in moist districts of the West Indies. It grows to the height of 50 feet, has oblong leaves two or three feet long, and large white blossoms carried on short peduncles. Its fruit, somewhat larger than a hen's egg, is pickled and eaten like the mango, which it strongly resembles in taste.

ANCHUSA, ăn-kū'sa. See ALKANET.

ANCHYLOSIS, ăn'ki-lō'sis. See JOINTS.

AN'CHYLO'STOMI'ASIS, disease due to the presence of an intestinal parasite, the *Anchylostomum duodenale* (*Uncinaria duodenalis*). This parasite lives in the upper portion of the small intestine, where, by means of a series of tooth-like hooks about the mouth, it attaches itself to the mucous membrane. It is particularly prevalent among Italian and Polish laborers, especially among those who work in confined spaces, as mines, tunnels, etc.

The chief symptoms are those due to the loss of blood which the worm constantly sucks from the wall of the intestine. Gastro-intestinal disturbance, progressive anæmia, diarrhœa and colicky pains with shortness of breath and swelling of the limbs are among the important symptoms. The diagnosis can be made by means of a microscopical examination of the fæces, in which the eggs are found, and also by the microscopical examination of the blood. Careful attention given to the drinking water is one of the most important prophylactic measures. See PARASITE.

ANCIEN RÉGIME, âṅ'zhăṅ rā'gēm', a French phrase commonly used, even by English writers, to denote the social and political system established in France under the old mon-

archy, which was swept away by the revolution of 1789. The phrase is generally applicable only to France, for in no other country, with perhaps the exception of Japan, has there been in modern times so clearly marked a division between "the old order" and the new.

ANCIENT DEMESNE, a term employed in English law to denote ancient estates belonging to the Crown. They are mentioned in Domesday Book as *Terræ Regis.*

ANCIENT LIGHTS, a term denoting windows so long existent that they have obtained a right to the light entering them and cannot be interfered with by the owner of the property whence the light enters. Rights of this nature cannot commonly be acquired by prescription in the United States. Ancient lights in England are now regulated by a statute calling for but 20 years' existence to create the right.

ANCIENT MARINER, The. The best known of the poems of S. T. Coleridge. It should be read, as it was doubtless written, as a poem of strange, romantic adventure full of the swing and charm of the old ballads. The story with its incidents and its pictures, the language with its phrases and figures, the poetic movement both in single lines and in stanzas,—all these are of the best of their kind and may give keen poetic pleasure. The poem, besides these things, is informed with a fine thought particularly expressed in the last words of the old sailor, which should not be neglected. The poem, however, is also somewhat of a landmark in English literature and has significance in literary history. Coleridge was a leader in that movement at the beginning of the 19th century which gave to English poetry once more the charm of mystery, wonder, adventure and romantic beauty. He has himself told us ('Biographia Literaria' Chap. 14) of the plan of 'Lyrical Ballads' by Wordsworth and himself. The two friends talked over their literary hopes and their poetic ideals and decided to publish their poems together. Wordsworth's part was to show how much poetic beauty there was in the simple life of every day; Coleridge was to "deal with strange supernatural subjects," so as really to arouse emotion and feeling. 'The Ancient Mariner' was the chief of Coleridge's few contributions and has always stood, if not exactly for the qualities which the author ascribes to it, for the essentially romantic in poetry.

EDWARD EVERETT HALE.

ANCIENT ORDER OF HIBERNIANS. See HIBERNIANS, ANCIENT ORDER OF.

ANCIENT ROME IN THE LIGHT OF RECENT DISCOVERIES, an archæological work by Rodolfo Lanciani: b. 1847. In his character of official investigator Professor Lanciani has grouped in this volume various illustrations of the life of ancient Rome as shown in its recovered antiquities. From these he reads the story of the wealth, taste, habits of life, ambitions and ideals of a vanished people.

ANCIENTS, Council of, the upper one of two branches of the legislative body of France, 1795-99. It included 250 members and its function was to consider measures submitted by the lower branch, the Council of Five Hundred.

ANCILE, a shield reported to have fallen from heaven in the time of Numa. It was believed to be the shield of Mars; and as the prosperity of Rome was held to depend upon its preservation, 11 facsimiles of it were made, that anyone wishing to steal it might not know which to take. It is conjectured to have been originally a lump of meteoric iron.

ANCILLON, äṅ'sē'yŏṅ', **Charles,** French Protestant leader: b. Metz, 28 July 1659; d. Berlin, 5 July 1715. He studied at Marburg, Geneva and Paris, where he was called to the bar. He became director of the Huguenot colony at Berlin and published several works on the revocation of the edict of Nantes and its consequences. His chief claim to remembrance is the work that he did for education in Prussia, and the share he took, in co-operation with Leibnitz, in founding the Academy of Berlin. Of his numerous works the only one still of value is the 'Histoire de l'établissement des Français réfugiés dans les états de Brandebourg' (1690).

ANCILLON, Johann Peter Friedrich, a German historian of French extraction: b. Berlin, 30 April 1767; d. there, 19 April 1837. Besides 'Mélanges of Literature and Philosophy' (1801) he was the author of a 'View of the Revolutions of the Political System of Europe since the 15th Century' (1803-05), which secured him the post of royal historiographer. From 1832 till his death he was Minister of Foreign Affairs.

ANCÓN, än-kōn', a Peruvian coast town, of special interest to archæologists as the site of an ancient necropolis. It is now a seaside resort 30 miles by rail northwest of Callao and has been the scene of several important historical events. Its anchorage was used by Lord Cochrane in 1820 during his attacks on Callao; it was the landing-place of an invading Chilean army in 1838; it was bombarded by the Chileans in 1880; and in 1883 it was the meeting-place of the Chilean and Peruvian commissioners who drew up the Treaty of Ancón, which ended the war between Chile and Peru (see CHILE). One of the noteworthy contributions to our knowledge of the culture and industries of the empire of the Incas was made by Reiss and Stübel as a result of their excavations at this place before 1880. They succeeded in making quite apparent the importance of the discovery of numerous objects which, as industrial products, belonged to the domestic economy of the people of the ancient Inca state. "All these objects," they wrote, "have been excellently preserved, a fact due to the scarcely accidental coincidence of two circumstances — climate and worship of the dead. To the dry climate we are primarily indebted for the fact that the rich contents of piously equipped graves have in manifold instances reached us uninjured, and that consequently the picture of a culture speedily swept away by the Spanish conquerors may still be restored." Their discoveries "in a single burial place, although one of great extent — the Ancón necropolis"— certainly helped, as they asserted, to "carry us back to the busy life and inner

soul of the ancient Indian populations.» Consult Reiss, W., and Stübel, A., 'The Necropolis of Ancón' (3 vols. folio, Berlin 1880–87).

ANCONA, ăn-kō'nạ, **Alessandro d',** Italian critic and philologist: b. Pisa, 1835, and from 1860 a professor of literature in the University of Pisa. Among the many works of this distinguished scholar are 'I Precursori di Dante' (1874) 'Origini del Teatro in Italia' (1877); 'La Poesia Popolare Italiana' (1878); 'Varietà Storiche e Lettarie' (1883–85); 'Manuale della letteratura Italiana' (1892–95).

ANCONA, Italian province of the kingdom of Italy, between Pesaro ed Urbino on the north, Macerata on the south, and the Apennines and Adriatic on the west and east; area, 736 square miles. It is a mountainous region watered by the rivers Cesano, Esino and Musone, and produces grain, wine, oil, olives, silk and fruit. Capital, Ancona. Pop. about 320,000.

ANCONA, an important Italian port on the Adriatic, the capital of the province of the same name. Its site is an amphitheatre between two headlands, and on its ancient mole, designed by Trajan, is a triumphal arch by Apollodorus. The modern mole is adorned by a triumphal arch by Vanvitelli. Among important buildings are the cathedral of Saint Cyriac dating from the 11th and 12th centuries, a 13th-century town hall and a museum. Sugar-refining, ship-building and manufactures of silk, paper and sail-cloth are the main industries. A United States consul is stationed here. The city is said to have been founded by Syracusans fleeing from the persecutions of the Elder Dionysius. Pop. about 57,000.

ANCONA, The. Italian liner, sunk in the Mediterranean on 7 Nov. 1915 by a submarine flying the Austrian flag. Bound from Naples for New York, the *Ancona* was one day out from Messina when she was torpedoed off the coast of Tunis with over 400 passengers on board and a crew of 172. There were 12 American passengers, of whom nine perished. The submarine fired upon the steamer, which, according to Italian report, hove to almost instantly after the first shot. The firing continued while the life-boats were being filled and lowered; before half of those on board could be got off in the boats a torpedo from the submarine struck and sunk the *Ancona,* sacrificing over 200 lives. The Austrian Admiralty asserted that the *Ancona* had attempted to escape and had been struck several times before heaving to; that 45 minutes' grace had been allowed by the submarine for those on board to take to the boats; that the cowardice of the crew and the prevailing panic had hampered the life-saving proceedings, and that the submarine had fired the torpedo after 50 minutes' delay, and then only because another steamer was approaching. It was denied that the lifeboats had been fired on.

An impression at first gained ground that the outrage had been committed by a German submarine masquerading under the Austrian flag, from the close resemblance between the methods of warfare employed, but the Austrian statement made it clear that that government assumed entire responsibility. The American Ambassador in Vienna was instructed to demand a detailed account of the *Ancona* affair from the Austro-Hungarian government. No reply being forthcoming for three weeks, a peremptory note, dated 6 December, from the American government was presented at Vienna. Admitting that the *Ancona* had attempted to escape after the first (solid) shot, the note protested that "the commander violated the principles of international law and of humanity by shelling and torpedoing the *Ancona* before the persons on board had been put in a place of safety or even given sufficient time to leave the vessel"; that the conduct of the commander could "only be characterized as wanton slaughter of defenseless non-combatants, since at the time when the vessel was shelled and torpedoed she was not, it appears, resisting or attempting to escape." The American government was unwilling "to credit the Austro-Hungarian government with an intention to permit its submarines to destroy the lives of helpless men, women and children. It prefers to believe that the commander of the submarine committed this outrage without authority and contrary to the general or special instructions which he had received." The United States government demanded a denouncement of the sinking of the *Ancona* "as an illegal and indefensible act; that the officer who perpetrated the deed be punished, and that reparation by the payment of an indemnity be made for the citizens of the United States who were killed or injured by the attack on the vessel." From the Austrian Admiralty reply dated 15 Dec. 1915 it appeared that the commander was instructed to prevent the *Ancona* from escaping "in all circumstances," and that his conduct "cannot be disapproved." A more lengthy note from the Foreign Minister, Baron Burian, defended the attitude of his government and "most sincerely deplored the fate of the innocent victims." The American reply (19 Dec. 1915) found "no other course open" but to hold the Austrian government "responsible for the act of its naval commander and to renew the definite but respectful demands" made in the note of 6 December. The incident was closed by a note from Baron Burian dated 29 Dec. 1915, in which he reviewed in detail the circumstances surrounding the *Ancona* affair. Every American demand, however, was granted on the ground that the commander of the submarine "had omitted to take adequately into consideration the panic that had broken out among the passengers"; that the officer in question had been punished, and that indemnity would be granted.

ANCRE, ăN'kr, **Concino Concini, Marshal and Marquis d',** a Florentine who went to France in 1600, where he obtained rapid promotion, more especially after the assassination of the King (1610). Successively governor of Normandy, marshal of France, and last of all Prime Minister, he was thoroughly detested by all. At last a conspiracy was formed against him and he was shot dead on the bridge of the Louvre in 1617.

ANCRE, France, town in the department of the Somme, near Péronne, on the Ancre River. Ancre was a barony in 1563, was raised to a marquisate in 1576, was acquired by Concini in 1610. After his death it passed to the King's favorite, Charles d'Albert, duke of Luynes. In June 1620 by royal decree the name was changed to Albert. In 1695 the

marquisate was acquired by the Count of Toulouse and in 1769 passed to the house of Orleans, of which a member, the Duke of Penthièvre, was proprietor in 1789. The town has been destroyed several times; at first by fire in 1451, by the Imperialists in 1523, by the Bourguignous in 1553, by the Spaniards in 1637 and by another fire in 1760. It was again destroyed in the Great War, being bombarded by the British and German forces alternately. Its principal manufactures are paper, leather, linen and foundry products. Pop. 5,473. See WAR, EUROPEAN.

ANCUD, ăn-kood, Chilean port, capital of the province of Chiloe. It is situated on the island of Chiloe, about 580 miles from Valparaiso, a line of steamships connecting the two. First settled in 1768, it was the last place surrendered by the Spaniards to the Chileans in 1826. Pop. about 3,500.

ANCUS MARCIUS, the fourth King of Rome: b. 638 B.C.; d. 614 B.C. The son of Numa's daughter, he attempted to imitate his grandfather by reviving the neglected observances of religion. His peaceful pursuits were disturbed by the Latins, whom he subdued and caused to be brought to Rome, where he assigned them the Aventine to dwell upon. These conquered Latins, according to Niebuhr, formed the original *plebs*. He fortified the Janiculum against Etruria, connecting it with the city by the wooden bridge across the Tiber known as the Sublician; dug the ditch of the Quirites; constructed the harbor of Ostia; and built the first Roman prison of which there is any record.

ANCYLOPODA, or **ANCYLODACTYLA,** an apparently primitive extinct subordinal group of Ungulata showing certain resemblances to the Perissodactyla, both as regards the cheek-teeth and the skeleton, but broadly distinguished by the feet being of an edentate type, carrying long curved and cleft terminal claws.

ANCYRA. See ANGORA.

ANDALUSIA, ăn'dă-lōō'zĭ-ă, Spain (Spanish, *Andalucia*), a district in the southern part of the country, celebrated for its fertility and picturesque beauty; bounded north by Estremadura and New Castile, east by Murcia, south by the Mediterranean Sea, and west by Portugal and the Atlantic. Length east and west about 310 miles; average breadth about 120; area about 33,650 square miles. It is traversed throughout its extent by ranges of mountains. It is divided into Upper and Lower Andalusia. The Sierra Morena runs along its northern border, and in the southeast rise the mountains of Granada and the Ronda, including numerous sierras, and among them those of the famous Sierra Nevada. Lower Andalusia comprises chiefly the valley of the lower Guadalquivir. Many summits of the southern ranges are covered with perpetual snow; the Mulahacen rising 11,678 feet, and the Picacho de Veleta 11,378 feet above the sea. All the mountains abound with mineral wealth, yielding chiefly copper, cinnabar and lead, as well as some silver and coal. Some mines have been opened by English companies, especially in the province of Huelva in the west, where the Tharsis and Rio Tinto copper mines are situated. The principal river of Andalusia is the Guadalquivir, which rises in the east part of the province of Jaen, near Carzola, and thence flows west-southwest, and below Seville south-southwest, entering the sea at San Lucar. Its principal affluents are the Guadalimar, Guadiato and Xenil. The rivers south of the Sierra Nevada are quite insignificant. The basin of the upper Guadalquivir lies at an elevation of from 500 to 1,500 feet, and consists mainly of saline wastes and other sterile tracts. The lower basin presents sharp contrasts: around Cordova and Seville luxuriant gardens; on the Xenil a desert without a drop of water; on the left bank of the lower Guadalquivir the extensive marshy district of Marisma; and stretching from the mouth of the Guadalquivir to that of the Rio Tinto, a sandy depression (Arenas Gordas) partially clothed with pine-woods. The lower regions have a very mild climate, but on the Atlantic coast the temperature is much lower, and snow falls frequently. The vegetation is of the character peculiar to the extreme south of Europe and the north of Africa. Wheat, maize, barley, many varieties of fruit, grapes, honey, silk and cochineal form important articles of culture. Many cereals ripen as early as April. A large portion of the soil is in pasture. The horses are the best breed in the Peninsula; the bulls of Andalusia are sought over all Spain for bull-fighting; sheep are reared in vast numbers, and bear an abundance of good but not fine wool; and the hogs reared on the acorns of the mountain forests furnish hams unsurpassed in any part of Europe. Andalusia has been known as the "granary" of Spain since ancient times, and still remains one of the most fertile districts of the country, although famine conditions have prevailed at intervals. The most recent instance was in 1905, when thousands emigrated. The chief manufactures are woolens, silk and leather, and are by no means extensive. The name Andalusia is commonly taken to have been originally Vandalusia, the land of the Vandals. The people are picturesquely attired; their language is Spanish with an admixture of Arabic. Pop. (1910), 3,828,916. In the 5th century Andalusia came into the possession of the Vandals, whose name it bears instead of Tartessis, which it bore in classical times. It is probably the Biblical Tarshish. The Carthaginians had acquired it in the 3d century B.C., and later passed to the Romans, by whom it was called Bætica, from the river Bætis (Guadalquivir). It became very prosperous under the Romans and rapidly absorbed their civilization. The Visigoths ousted the Vandals and ruled the country until the advent of the Arabs in 711. Andalusia now entered on its golden age; Cordova, Granada, Seville and Jaén, all within its borders, became centres of Mohammedan culture, commerce and industry. It was the home of learning, of art, chivalry and toleration. Cordova has been called the Athens of the West, the seat of the arts and sciences; and when the gloom of the Dark Ages spread over Europe, Andalusia was perhaps the brightest spot in that continent. Its glory faded with the disruption of Spanish Islam in the 11th century. Granada, it is true, held out for two centuries longer and the gen-

ius of the Moorish race made its home there. In 1492 Granada fell into the hands of Christian Spain. In Spanish times the names of Cano, Murillo and Velasquez have shed everlasting lustre on Andalusia. Consult Laine, 'Sur les routes d'Andalousie' in *La Nouvelle Revue* (No. 115 Paris 1898), and Murray. 'The Cities and Wilds of Andalusia' (London 1853); Hare, A. J. C., 'Wanderings in Spain' (8th ed., London 1904); Poole, S. Lane, 'Moors in Spain (ib. 1886); Villaescusa, M. H., 'Las Provincias de España' (Barcelona 1905).

ANDALUSITE, a native anhydrous silicate of aluminum, first discovered in Andalusia. Its chemical formula is Al_2SiO_5, and it crystallizes in the orthorhombic system. It usually occurs in coarse crystals, prismatic in form, and nearly square. Its hardness is 7.5, at least on the basal face, and its specific gravity about 3.18. Andalusite is commonly subtranslucent and varies greatly in color. Some specimens are strongly pleochroic, changing from olive green to blood red according to the angle at which the incident light strikes them. A variety known as chiastolite contains carbonaceous impurities distributed through the prismatic crystal according to a definite geometric plan, so that a transverse section of the crystal presents a curious tesselated or cruciform appearance. A variety from eastern Finland has been called "maltesite," from the regularity of the Maltese cross it exhibits when seen in section. Andalusite is found in many parts of Europe, usually in schist or gneiss. Fine specimens also come from the province of Minas Geraes, Brazil. In the United States it occurs in Maine, New Hampshire, Vermont, Massachusetts, Connecticut, Pennsylvania, South Dakota and California.

ANDAMANS, ăn'dă-manz, a chain of volcanic islands in the Bay of Bengal, 590 miles from the mouth of the Hugli, 120 miles from Cape Negrais in Burma, the nearest point on the mainland. Five large islands closely grouped together are called the Great Andaman, and to the south is the island of Little Andaman. There are some 200 islets, the two principal groups being the Andaman Archipelago and the Labyrinth Islands. The total area is 2,260 square miles. The Great Andaman group is about 219 miles long, and at the widest 32 miles broad. The group, densely wooded, contains many valuable trees, the best known of which is the padauk or Andaman redwood. The islands are hilly, the highest point, Saddle Peak, being 2,402 feet, and Mount Harriet, 1,196 feet in height. The islands possess a number of harbors and safe anchorages, notably, Port Blair, Port Cornwallis and Stewart Sound, the last being most favorably situated for forest trade. The aborigines, 1,317 (628 males and 689 females) in 1911, live in small groups over the islands; they are savages of a low Negrito type. The total population in 1915 was 25,732. The climate is tropical, the rainfall irregular and often excessive. In 1914 forest sales, the result of convict labor, amounted to $13,931.59. Tea, the cocoanut, manila hemp and Bahamas aloe are successfully cultivated. In 1914 there were 12,233 head of cattle. Wireless telegraphy with Burma was established in 1904. A mail steamer connects Port Blair with Calcutta, Rangoon and Madras. The islands have been used since 1858 by the government of India as a penal settlement for life and long-term convicts. The settlement possesses about 26,600 acres of cleared land and 156 square miles of reserved forest. There were, in 1915, 12,252 convicts (including 570 women) in the place, of whom some 1,730 were on ticket-of-leave in the settlement supporting themselves. Of the women, about half are on ticket-of-leave, and married to convicts.

The Andaman Islands are under the government of India, and the officer in charge is the superintendent of Port Blair. The civil, military and convict population of Port Blair in 1915 was 16,914. For the ethnography of the Andaman aborigines consult Kloss, 'In the Andamans and Nicobars' (1903); Man, 'The Aborigines of the Andaman Islands' (London 1885); Portman, 'Notes on the Languages of the South Andaman Group' (Calcutta 1898); "The Andaman Islands" (in *The Indian Antiquary,* Vols. XXVIII and XXX, Bombay 1899–1900).

ANDENNE, Belgium, a small manufacturing town on the southern bank of the Meuse, eastward of Namur and west of Huy, with a population of nearly 9,000 inhabitants, chiefly engaged in paper-making, faïence and pottery work. For many centuries, down to 1785, a female religious community belonging to one of the "open" orders, i.e., not bound by any vows, had existed here. On the opposite bank of the river lies the town of Seilles, connected with Andenne by a bridge for pedestrians with a single carriageway. During the German invasion of Belgium this light structure was blown up by the Belgian troops at 8 A.M. on 19 Aug. 1914. A few hours later an advanced guard of Uhlans entered Andenne, seized the cash at the tax-office and took away with them the burgomaster, an old, corpulent man, who was compelled to keep pace with their horses at a run. By evening a large body of German troops had entered the town without meeting any resistance. On the following afternoon (20 August) shots were fired from the opposite bank of the Meuse, from Seilles, to which the Germans in Andenne replied. Immediately turning upon the inhabitants (of Andenne), the Germans brought machine guns into play and shot them down in large numbers for over two hours. At 7 P.M. a considerable portion of the town was in flames. At 6 on the following morning the Germans began to drag the inhabitants from their houses. Men, women and children were driven into the square, where the sexes were separated. Three men were then shot and a fourth bayoneted. The German colonel in command accused the population of firing on the soldiers; some of the prisoners were picked out, taken to the banks of the Meuse and there shot. "Other places have suffered more than Andenne, but no other Belgian town was the theatre of so many scenes of ferocity and cruelty" (Belgian Report). The Bryce Committee stated in their report that "About 400 people lost their lives in this massacre, some on the banks of the Meuse, where they were shot according to orders given, and some in the cellars of the houses where they had taken refuge." The German reply to the allegations (White Book; see AERSCHOT) was that "the demeanor of the in-

habitants was positively devilish»; that «a furious fire broke out on all sides on the unsuspecting troops,» and that «hand-bombs and hand-grenades were rained down on the defenseless men nearest at hand. . . . Machine guns sent their murderous bullets into the files of the soldiery.» In the same report, Maj. Freiherr von Langermann testifies that the German losses were «singularly small; the inhabitants had aimed very badly.» Lieutenant Götze, who had been sent to Andenne to interrogate some of the survivors, reports that the burgomaster handed him a list of 234 persons who had been shot. «An examination of this list,» said Lieutenant Götze, «proved that only in the case of 196 persons is it absolutely certain that they were shot; 28 were merely missing.»

ANDERNACH, än'dėr-näg, Germany, a town in the Prussian Rhine province, on the left bank of the Rhine, 10 miles northwest of Coblenz. Viewed from the river it makes a gloomy, though picturesque, impression, with its parish church (a basilica dating from the 12th century, with four towers), the round watch-tower on the Rhine and a famous crane (erected 1554) for lading merchandise. Among other buildings are a Gothic Minorite church (now Protestant), a town hall and a prison, formerly the castle of the archbishops of Cologne. Andernach has considerable industries, brewing and manufactures of chemicals and perfumes, and has also a trade in corn and wine. But its most notable article of commerce is that of mill-stones, made of lava and tufa-stone, a product much used by the Dutch in the construction of their dykes. It was founded by Drusus in the 3d century. In 1109 it received civic rights, and in 1253 joined the confederation of the Rhine cities. In 1794 it passed to France, but in 1815 was ceded to Russia. Pop. about 10,000.

ANDERSEN, än'der-sen, **Hans Christian,** a Danish novelist, poet and writer of fairy tales: b. in Odense, 2 April 1805; d. Copenhagen, 4 Aug. 1875. He learned to read and write in a charity school, whence he was taken when only nine years old, and was put to work in a manufactory in order that his earnings might assist his widowed mother. In his leisure time he eagerly read national ballads, poetry and plays, and wrote several tragedies which he failed to get accepted. His abilities at last brought him under the notice of Councilor Collin, a man of considerable influence, who procured for him free entrance into a government school at Slagelse. From this school he was transferred to the university and soon became favorably known by his poems. His first considerable work, 'A Journey on Foot from Holmen's Canal to the East Point of Anger,' was published in 1828, the year of his admission to the university. Through the influence of Oehlenschläger and others he received a royal grant to enable him to travel, and in 1833 he visited Italy, his impressions of which he published in 'The Improvisatoren' (1835), a work which rendered his fame European. The scene of his following novel, 'O. T.,' was laid in Denmark, and in 'Only a Fiddler' he described his own early struggles. In 1853 appeared the first volume of his 'Fairy Tales,' of which successive volumes continued to be published year by year at Christmas, and which have been the most popular and widespread of his books. Among his other works are 'Picture-books without Pictures,' 'A Poet's Bazaar,' and a number of dramas. In 1845 he received an annuity from the government. He visited England in 1848 and acquired such a command of the language that his next work, 'The Two Baronesses,' was written in English. In 1853 he published an autobiography under the title, 'My Life's Romance,' an English translation of which, published in 1871, contained additional chapters by the author, bringing the narrative to 1867. Among his later works are 'In Sweden' (1849); 'To Be or Not to Be' (1857); 'Tales from Jutland' (1859); 'The Sand-hills of Jutland' (1860); 'The Ice Maidens' (1863); 'In Spain' (1863).

ANDERSEN'S FAIRY TALES. See FAIRY TALES.

ANDERSON, David, Canadian clergyman: b. London 1814; d. 1885. He was educated at Edinburgh Academy and Exeter College, Oxford; consecrated bishop of Ruperts' Land, 29 May 1849; resigned in 1864; was subsequently appointed chancellor of Saint Paul's Cathedral, London, England, and vicar of Clifton. He founded Saint John's College, Winnipeg.

ANDERSON, Edwin Hatfield, American director, New York Public Library: b. Zionsville, Ind., 27 Sept. 1861. He was graduated from Wabash College as A.B. in 1883, later receiving the degree of A.M., and spent a year at New York State Library School, Albany, N. Y., in 1890 and 1891. He was cataloguer for one year at the Newberry Library, Chicago, Ill.; librarian of the Carnegie Free Library at Braddock, Pa., three years; and organized and was the first librarian of the Carnegie Library of Pittsburg, Pa., from 1895 until his resignation in December 1904. He was engaged in zinc and lead mining at Carthage, Mo., during 1905; from 1 Jan. 1906 to June 1908 director of New York State Library and Library School; June 1908 to May 1913 assistant director of the New York Public Library; 14 May 1913 to date director of the New York Public Library. President of the Keystone State Library Association in 1901–02; member of the Public Records Commission and of the Historical Archives Commission of Pennsylvania in 1903–04; president of the New York Library Association in 1908, and of the New York Library Club in 1910; president of American Library Association 1913–14; Litt.D. Carnegie Institute of Technology, 1915.

ANDERSON, Elizabeth Garrett, English medical practitioner: b. Aldeburgh, Suffolk, 1836; d. there, 17 Dec. 1917. She was educated at a private school. In 1860 she resolved to study medicine, an unheard-of thing for a woman in those days, and one which was regarded by old-fashioned people as almost indecent. Miss Garrett managed to obtain some more or less irregular instruction at the Middlesex Hospital, London, but was refused admission as a full student both there and at many other schools to which she applied. Finally she studied anatomy privately at the London Hospital, and with some of the professors of Saint Andrew's University and at the Edinburgh Extra-Mural School. She had no

less difficulty in gaining a qualifying diploma to practise medicine. London University, the Royal College of Physicians and Surgeons and many other examining bodies refused to admit her to their examinations; but in the end she was allowed to enter for the License of Apothecaries' Hall, which she obtained in 1865. In 1870 she obtained the Paris degree of M.D. In 1871 she married J. G. S. Anderson (d. 1907), a London shipowner. She worked steadily at the development of the New Hospital for Women and at the creation of a complete school of medicine in London for women. In 1908 she was elected mayor of Aldeburgh, the first lady mayor in England. The movement for the admission of women to the medical profession, of which she was the indefatigable pioneer in England, has extended to every civilized country except Spain and Turkey.

ANDERSON, George B., an American Confederate soldier: b. Wilmington, N. C., 1831; d. 16 Oct. 1862. He was graduated from West Point in 1852, and in 1855 obtained his commission as first lieutenant in the United States army, and served as regimental adjutant after 1858. Entering the Confederate service in 1861, he was made a brigadier-general and placed in command of the North Carolina coast defenses. While leading a brigade at the battle of Antietam, 17 Sept. 1862, he received the wound which caused his death.

ANDERSON, George Thomas, Confederate general: b. Covington, Ga., 3 Feb. 1824; d. Anniston, Ala., 4 April 1901. He entered Emory College, Oxford, Ga., but on the outbreak of the trouble in Texas, left to join General Kearney's command as lieutenant of cavalry, distinguished himself in various engagements, and on being mustered out received a captain's commission in the regular army. In 1861 he became colonel of a Georgia regiment, fought at the first Manassas or Bull Run, and succeeded to the command of Barton's brigade on the latter's death. He fought throughout the Seven Days' battles (q.v.) about Richmond; was wounded at the second Bull Run; on 1 Nov. 1862 was commissioned brigadier-general for gallantry and skill at Antietam, 16–17 Sept. 1862; fought at Fredericksburg; was wounded at Gettysburg; and upon his recovery was sent with Longstreet to Bragg's assistance in north Georgia. He participated in the battles of Chattanooga, Knoxville, Wilderness, Spottsylvania and Cold Harbor and throughout the protracted struggle around Richmond, and was present at the surrender at Appomattox. After the war he served in several official positions in Georgia, for a short time was freight agent of the Georgia Railroad at Atlanta, was chief of police of that city and later became city clerk and tax collector of Anniston, Ala.

ANDERSON, Henry John, American educator: b. New York, 6 Feb. 1799; d. Lahore, Hindustan, 19 Oct. 1875. He was graduated from Columbia College, 1818; M.D. College of Physicians and Surgeons, 1823. Professor of mathematics and astronomy at Columbia, 1825–50; trustee 1851, and professor emeritus 1866; geologist to the Dead Sea expedition under Lieutenant Lynch; member of the scientific expedition to observe the transit of Venus, 1873. He died while exploring the Himalayas. He early became converted to the Catholic faith and was active in promoting its interests in New York city. The United States government publish his 'Geology of the Expedition to the Dead Sea' (1848).

ANDERSON, James, Scottish agricultural economist: b. Hermiston, in Midlothian, Scotland, 1739; d. Isleworth 1808. When scarcely 20 years of age he invented the small two-horse plow without wheels, known as the Scotch plow. Four years later he left Hermiston and rented a large moorland farm of 1,300 acres in Aberdeenshire, where he devoted his leisure hours to writing on agricultural subjects, his first production being a series of essays on planting contributed to the Edinburgh *Weekly Magazine.* His principal works are, 'Encouragement of the National Fisheries'; 'An Inquiry into the Nature of Corn Laws'; 'Observations on Slavery' and 'Recreations in Agriculture, Natural History, Arts and Miscellaneous Literature' (1799–1802).

ANDERSON, John, Scottish philosopher, founder of Anderson College, Glasgow: b. Roseneath, Dumbartonshire, 1726; d. 1796. He studied at the University of Glasgow, where he was afterward professor of Oriental languages, and later of natural philosophy. In addition to his usual class in physics he instituted one for artisans, which he continued to conduct to the end of his life. In 1786 appeared his 'Institutes of Physics,' which went through five editions in 10 years. He invented a gun whose recoil was stopped by air condensation; but having in vain endeavored to attract the attention of the British government to it, he went to Paris in 1791 and presented his model to the National Convention. It was hung up in their hall with this inscription over it, "The Gift of Science to Liberty." When the allies had drawn a military cordon around the frontiers of France Anderson suggested the expedient, which was adopted, of making small paper balloons, to which newspapers and manifestos were fastened and carried to Germany. Anderson by his will directed that his entire effects should be devoted to the establishment of an educational institution in Glasgow for the use of the unacademical classes. This college, opened with a single course of lectures, has now nearly 20 professors and lecturers; courses of instruction are given in physical and medical science and in chemistry; mathematics, Latin, Greek, Hebrew, French, music, etc., are also taught. As a school of medicine in particular it possesses a high reputation.

ANDERSON, John, Scottish missionary to India: b. in the parish of Kilpatrick-Durham, 23 May 1805; d. Madras, 25 March 1855. He was educated at Divinity Hall, Edinburgh. He was appointed to Madras as a missionary of the Church of Scotland, 28 June 1836, and sailed 13 August. He became at once the principal of Saint Andrew's School; this afterward developed into the Madras Christian College. His fame as an educator spread abroad over all India. Hundreds were educated by him. A splendid hall was built in Madras to perpetuate the memory of Mr. Anderson.

ANDERSON, John Fisher, American physician and bacteriologist: b. Fredericksburg, Va., 14 March 1873. Having gained his degree of M.D. in the University of Virginia in 1896,

he was appointed passed assistant surgeon in the United States Public Health and Marine Hospital Service. In 1899 he became sanitary observer at Glasgow, Liverpool and Oporto, and, in 1900, sanitary attaché at the United States consulates at Barcelona, Marseilles and several other European cities. During his service abroad he continued his studies at the Thompson-Yates Laboratory and the School of Tropical Medicine in Liverpool and at the Patologische Institut in Vienna. In 1902 he was appointed assistant director of the Hygienic Laboratory at Washington, becoming director in 1909. In 1913 he was appointed chief of the investigation into the claims of Dr. F. F. Friedmann that he had discovered in his "turtle serum" a cure for tuberculosis. He collaborated with T. B. McClintic on 'A Method of Standardizing Disinfectants' (1912).

ANDERSON, Martin Brewer, American educator: b. Brunswick, Me., 12 Feb. 1815; d. 26 Feb. 1890; was graduated at Waterville College, now Colby University, in 1840; became professor of rhetoric and organized and taught the course in modern history at Waterville; and was president of the University of Rochester, N. Y., 1853 to 1888.

ANDERSON, Mary Antoinette, American actress: b. Sacramento, Cal., 28 July 1859. She was educated at the Ursuline Convent and the Academy of the Presentation Nuns in Louisville, and when 13 years of age began to study for the stage. She first appeared at Louisville, 27 Nov. 1875, in the character of Juliet. Her success was immediate, and during the following years she played with increasing popularity in the principal cities of the United States in various rôles. In 1883 she appeared at the Lyceum Theatre in London and opened the Memorial Theatre at Stratford-on-Avon in the character of Rosalind in 'As You Like It,' and speedily became well known in England. At the age of 28 she married Antonio de Navarro and retired from the stage. In 1896 she published a volume entitled, 'A Few Memories.' Consult her autobiography 'A Few Memories' (1896); Winter, William, 'Stage Life of Mary Anderson' (1886).

ANDERSON, Melville Best, American educator and author: b. Kalamazoo, Mich., 28 March 1851. He was educated at Cornell University (1870–74); the University of Göttingen (1875–76) and at the University of Paris (1876–77). Returning to the United States he occupied several professorships in some of the principal colleges, notably Butler University, Purdue University, the State University of Iowa, and in 1891 became professor of literature in Leland Stanford, Jr. University, and since 1910 professor emeritus. He has translated and edited 'Paul and Virginia'; Hugo's 'William Shakespeare'; Boissier's 'Mme. de Sévigné'; Caro's 'George Sand'; Simon's 'Victor Cousin'; Sorel's 'Montesquieu'; Say's 'Turgot'; Rémusat's 'Thiers'; Joutel's 'Journal of La Salle's Last Voyage' (1896); Tonty's 'Relation' (1898); 'Nicholas de La Salle's Narrative' (1898); 'Cavalier de La Salle's Discovery of the Mississippi River' (1901), etc. He also edited 'Bacon's Essays, with Introduction and Notes' (1890); and wrote 'Representative Poets of the Nineteenth Century' (1896); 'Happy Teacher' (1910). For 10 years he was engaged upon a translation in triple rime of Dante's 'Divina Commedia.' He has contributed to various literary periodicals.

ANDERSON, Rasmus Bjorn, American author, editor and diplomat: b. Albion, Wis., 12 Jan. 1846. His parents were among the first emigrants from Norway to America, coming in 1836. Rasmus Bjorn was graduated with the first class from Luther College, Decorah, Iowa, in 1866. From 1866 to 1869 he was professor of Greek and modern languages at Albion Academy, Wisconsin, and from 1869 to 1875 instructor in languages at the University of Wisconsin. Because of the general interest he developed in Scandinavian studies he was made professor of Scandinavian languages and literature in the University of Wisconsin in 1875, being the first to hold such a chair outside of the Scandinavian countries. In 1889 he was appointed United States Minister to Denmark, serving until 1889. Since 1898 he has been editor and publisher of *Amerika,* a weekly Norwegian newspaper published at Madison, Wis. He has also been president of the Wisconsin Life Insurance Company since 1895 and of the Wisconsin Rubber Company since 1904 and served a short term as postmaster of Madison in 1912.

By reason of the intelligent interest he has created in Scandinavian culture Professor Anderson has often been styled the father of Norse literature in America. His first important work appeared in 1874, entitled 'America Not Discovered by Columbus,' an historical argument to substantiate the claims of the discovery of America by the Northmen in the 10th and 11th centuries. In 1875 appeared 'Norse Mythology,' an exposition of the early mythological system of the north. Both of these works have appeared in several editions and have been translated into German, French, Scandinavian and Italian. Other more prominent works are 'Viking Tales of the North' (1877); 'The Younger Edda' (1880); 'First Chapter of Norwegian Immigration' (1895) and his 'Autobiography' (1915). In this work Professor Anderson gives, in connection with a review of his own life, a survey of the Norwegian settlements in America and the activities of the nationality, as well as many hitherto unpublished incidents of statesmen and scholars whose acquaintance he formed as diplomatist and author. Professor Anderson's translations have been many. In the early eighties he translated the novels of Bjornstjerne Bjornson for an American edition. Other translations that followed were 'History of Literature' (from the Danish) (1884); 'Eminent Authors of the 19th Century' (Danish, 1886); 'Teutonic Mythology' (from the Swedish, 1889); 'Among Cannibals' (Swedish, 1889). As literary editor Professor Anderson in 1889 supervised an English revision of Laing's 'Sagas of the Kings of Norway,' supplying also the notes and maps. In 1905–06 he was the editor-in-chief in the preparation of the 'Norraena Library,' a sumptuous edition of 16 volumes containing the most notable productions of Scandinavian literature from earliest times.

Professor Anderson has been a voluminous contributor to the contemporary press and for

years was a regular contributor to the *Dial* and the *Nation*. He has also contributed to the 'Encyclopedia Americana' and other works of reference.

ANDERSON, Richard Henry, American Confederate soldier: b. South Carolina, 7 Oct. 1821; d. Beaufort, S. C., 20 Feb. 1879. Graduated from West Point in 1842; served in Mexican War. In May 1861 he resigned from the United States army to join the Confederate service. He assisted in the bombardment of Fort Sumter and distinguished himself for gallantry throughout the war, especially at Fair Oaks, Gaines Mills, Frazier's Farm, Bull Run and Gettysburg. He had the rank of major-general (1862) and lieutenant-general (1864), commanding the 4th corps of Lee's army in the last campaign.

ANDERSON, Robert, American soldier: b. near Louisville, Ky., 14 June 1805; d. in France, 26 Oct. 1871. Graduating at West Point 1825, he entered the artillery as second lieutenant. He was on Scott's staff in the Seminole War, 1837–38; in the Mexican War was badly wounded at Molino del Rey. Commissioned major in 1857, in 1860 he was given command of the troops in Charleston harbor, with headquarters at Fort Moultrie. Threatened with attack, the fort untenable and the Buchanan administration making no reply to his appeals for its strengthening or for instructions, on 26 December he removed the garrison to Fort Sumter. An attempt of the government to provision it being assumed by the Confederates as a declaration of war, they invested it and compelled its surrender by a bombardment, 12–13 April 1861; its commander leaving with the honors of war. Appointed brigadier-general, he was assigned to the department of the Cumberland; but his health failing, he was relieved from active duty in October and retired in 1863. Brevetted major-general in 1865, in 1869 he went to Nice, France, for his health. He wrote works on tactics, and was instrumental in organizing the Soldiers' Home at Washington.

ANDERSON, Rufus, American Congregational clergyman, and secretary of the American Board of Foreign Missions: b. North Yarmouth, Me., 17 Aug. 1796; d. Boston, Mass., 30 May 1880. Having graduated at Bowdoin College in 1818, he studied theology at the Andover Theological Seminary, completing his course in 1822. In 1824 he became assistant secretary to the Board of Foreign Missions, serving as such till 1832, when he became full secretary. In this position he continued for 34 years, till 1866, when owing to his advanced age and failing health he retired. He inspected the missions in the Mediterranean in 1828–29 and again in 1843–44, the results of his tours of these years being chronicled in his 'Observations on the Peloponnesus and Greek Islands' (Boston, 1830). He also visited the Indian Missions in 1854–55, and the Sandwich Islands in 1863. From 1867 to 1869 he was lecturer on Foreign Missions in the Andover Theological Seminary. He with others founded the Mount Holyoke Female Seminary, at South Hadley, Mass., was for several years president of the board of trustees of Bradford Academy, Mass., and a member of the board of trustees of the Andover Theological Seminary. Besides his 'Observations' he also wrote 'The Hawaiian Islands, Their Progress and Condition under Missionary Labors' (1864); 'A Heathen Nation Civilized'; 'A History of the Sandwich Islands' Missions' (1870); 'History of the Missions of the American Board of Commissioners for Foreign Missions to the Oriental Churches' (3 vols., 1872–74), etc.

ANDERSON, William Franklin, American clergyman: b. Morgantown, W. Va., 22 April 1860. He studied at West Virginia University, graduated from Ohio Wesleyan University, 1884; Drew Theological Seminary, 1887; A.M. New York University 1898. He entered the ministry of the Methodist Episcopal Church, joining the New York Conference in 1887. From 1904 to 1908 he was corresponding secretary of the Board of Education of his Church. In 1908 he was elected bishop and is now resident bishop of Cincinnati. He is the author of 'The Compulsion of Love' (1903); editor *The Challenge of To-day* (1915). He also edited the magazine *The Christian Student* 1904–08.

ANDERSON, Ind., city and county-seat of Madison County; on the White River, 36 miles northeast of Indianapolis on the New York Central Lines, Pennsylvania Lines and C. I. Railway. It is also the headquarters of the Union Traction System, one of the most extensive systems of electric traction lines in the middle west. The power-house, costing $1,000,000, is the largest in the State, generating the power which carries cars to every important city in northern and central Indiana. There is also a belt railway for factory service.

The city of Anderson lies in the centre of a rich agricultural region and is also an important manufacturing centre. Here was established one of the first and largest tin plate mills, introducing that industry into the United States. One hundred and fifteen factories are engaged in industrial enterprises where nearly every commodity known to trade is made. Chief among these are glass, wire fence, steel springs, nails, automobiles, oil and gas engines, street cars, paper boxes, bottles, silos, aeroplanes, carriages, shovels, files, wind pumps, steel fence posts, magnetos and self-starters for automobiles, vacuum cleaners, rubber tires, bed springs, mattresses, motor trucks, enamel ware, encaustic tiles, etc. The United States census of 1914 recorded 114 manufacturing establishments of factory grade, employing 4,613 persons, of whom 3,905 were wage earners, receiving a total of $2,425,000 annually in wages. The capital employed was $11,757,000, and the yearly output was valued at $12,789,000; of this, $5,578,000 was added by manufacture. Natural gas was discovered in 1887, and while the flow has diminished to some extent it is still sufficient in supply for heating and small manufacturing purposes.

The city has eight banking institutions, with a capitalization of over $700,000, and deposits of $6,000,000; three daily papers; an excellent fire department, and owns and operates its own water works and electric light and power department. The city debt has been paid off by these plants. Electric power can be furnished at one and one-quarter cents per k. w. and light at one and three-quarter cents per k. w. Among the prominent buildings are the court-

house, erected in 1882 at a cost of $200,000, the government building for postal service, a Carnegie library, an orphans' home, a Y. M. C. A. constructed at a cost of $275,000. The prehistoric Mounds Park is located near Anderson, which has several smaller parks and playgrounds. There is an excellent school system with 13 public schools and one parochial, attended by over 6,000 pupils, and a fine new Manual Training High School, costing $380,000, with 700 pupils. Nearly all religious denominations are represented and well housed.

The first settlement was in 1822, when, as the home of the Delaware Indians, it was known as Anderson's Town, the chief of the Delaware tribe being known as "Kik-tha-we-nund, or Anderson." Anderson's Town became a county-seat in 1827. The name was changed to Anderson by act of the legislature in 1838, and in 1865 the city was incorporated. The city government is vested in a mayor elected every four years, a council from three wards, clerk, city comptroller and board of works. The value of taxable property is $11,000,000. Pop. (1910) 22,476; (1915) 30,000.

ANDERSON, S. C., city and county-seat of Anderson County. Three railroads, Blue Ridge Railroad (branch of the Southern Railway) and C. & W. C. Railway and electric Interurban, Piedmont & Northern, connecting Anderson with Greenville, Greenwood and Spartanburg, S. C. Centre of South Carolina division of the celebrated Piedmont section, also in one of the two aseptic zones of the United States, it being a medical fact that wounds heal with twice the rapidity in these zones than elsewhere in the entire country. Fifteen churches representing all denominations. Eight schools, seven for white children and one for colored pupils. Number of pupils enrolled 1 Jan. 1916, white 2,656; colored 1,306. Number of teachers and instructors in the schools, white 55, colored 21. Value of buildings used for school purposes, not including leased property, white $132,000, colored $10,000. School enrolment 1 Jan. 1915, 3,381, increase in 1916, 581 pupils. Anderson College, a seminary for young women, value of buildings and equipment, $250,000, employs a faculty of 16 teachers and instructors, attendance 115. Anderson County is second largest in the State in the production of cotton, corn and feed stuff. Nine cotton mills within a radius of five miles of the courthouse, employing 3,200 operatives, three cotton oil mills and two fertilizer plants, foundry and machine works, two ice plants, two flour mills, three wholesale lumber mills, planing mills and variety works, mattress and spring bed factory, horse collar factory, patented metal shingle factory. The United States census of 1914 reports 28 establishments of factory grade, employing 1,254 persons, of whom 1,145 are wage earners, receiving $392,000 annually in wages. The capital employed was $2,575,000, and the value of the year's output was $1,904,000; of this, $646,000 was the value added by manufacture. The city has a gas plant with 16 miles of mains and daily capacity of 165,000 cubic feet; water works and electric lights, 20,000 horsepower plant located on Sececa River, 35 miles of water mains, 9 miles of street railway, 7½ miles of paved streets, paid fire department, auto engine and two horse-drawn trucks, 1,215 telephones. Taxable property within the city limits, not including six of the city's largest industries, $1,150,000. Aldermanic form of government vested in mayor and six aldermen. Pop. (1900) 5,498; (1910) 9,654, percentage of increase 75 per cent; (1915) 17,500, percentage of increase 81 per cent. Increase for past 25 years of 479 per cent.

ANDERSONVILLE, Ga., a village of Sumter County, 62 miles southwest of Macon, noted as the seat, during the Civil War, of a military prison of the Confederate States. This prison was established in November 1863, and consisted of an unsheltered enclosure containing at first 22 acres, an area subsequently increased to 27. It was commanded by Gen. W. S. Winder, but the superintendent was one Henry Wirz, a Swiss. It has been stated that Andersonville was selected as a suitable site because secure against Federal raiders and generally considered healthful; but that the laying waste of the fields of the South and the destruction of the means of transportation brought upon the Southern army and people great suffering, in which prisoners of war necessarily shared. It is true that rations were meagre for Confederate soldiers, to whose fare such prisoners were legally entitled. But evidence shows that the conditions which prevailed at Andersonville were due to mismanagement and cruelty; such evidence including ample Confederate testimony, as for example that rendered by Dr. G. S. Hopkins and Surgeon H. E. Watkins, constituting a Confederate medical commission (1864), and that by Colonel Chandler of the Confederate War Department in an inspection report (5 July 1864). Into the enclosure as many as 33,000 prisoners were at times crowded, for the most part completely without shelter, and supplied with insufficient and unsuitable food. Between February 1864 and April 1865 there were received at the prison 49,485 prisoners, of whom 26 per cent, or over 12,800, died there. In the autumn of 1864 the Confederate government removed many to Florence, S. C., and Millen, Ga., where they fared decidedly better. Wirz was convicted in 1865 by a military court under an indictment charging him with injuring the health and destroying the lives of prisoners, and was hanged 10 November. The prison burying-ground was made a national cemetery. Consult Stevenson, R. R., 'The Southern Side; or Andersonville Prison' (1876); Chipman, 'The Horrors of Andersonville Rebel Prison' (1891); Schouler, 'History of the United States' (Vol. VI, 1899).

ANDES, ăn'dēz, the great mountain mass, or, as Humboldt called it, "the largest mountain chain of the globe," extending along the entire western coast of South America and turning toward the east in the regions between the equator and lat. 12° N. Prolongations of the chain still farther eastward and, on the other hand, toward the extreme south, cannot be discussed conveniently in this place; it is, however, essential to note the deflection below the Caribbean Sea and the interposition of the Antillean continent (compare article CENTRAL AMERICA) between the Andean Cordillera and the quite distinct and separate mountain sys-

tems of western North America. In regard to the derivation of the name Humboldt wrote: "Andez, in the Quichua language (which lacks the consonants *d, f* and *g*), *Antis,* or *Ante,* appears to me to be made from the Peruvian word *anta,* signifying copper or metal in general."

In the recent work by Professors Pirsson and Schuchert we find a condensed statement that supplies an outline of the geological story of the Andes as a whole:

"Toward the close of the Cretaceous, the Andes had been elevated and folded throughout the length of South America (4,500 miles), and during most of Tertiary time an extensive peneplain (in places it was a postmature surface) was being developed in the central Andes. Vertical uplift began in later Tertiary time, elevating this peneplain from 3,000 to 7,000 feet. This was in turn eroded to mature slopes and then was rapidly warped in Pliocene and early Pleistocene time, so that now the deeply dissected erosion surface of the old peneplain stands at an average elevation of 12,000 feet, though locally it varies between 6,000 and 15,000 feet. Upon it in the west rest immense lava flows and lofty volcanic cones, some of which attain a height of 21,000 feet above the sea. These are part of a great volcanic field whose development began in the early Tertiary and was completed soon after the Pliocene uplift began. The central Andean plateau is the second highest in the world, being exceeded only by that of western Tibet to the north of the Himalayas of India, where the intermontane plains range from 14,000 to 17,000 feet above the sea."

We shall now endeavor to obtain clear views of the five chief divisions of this great uplifted region, namely, the far southern, the south central, the central, the equatorial and the northern.

The mountain region of Argentine Patagonia, which first claims attention in the far southern division, is very different from the Pampa region in topography, climate and vegetation. The rainfall is very much heavier and all the conditions of the country are changed accordingly. Sheep-raising, which is the great industry of the Pampas, is not practicable in the forested Cordillera, as the feed is not suited to sheep, whereas cattle-raising, which is unsuccessful in the drier part of the Pampas, will always be a principal industry in the Cordillera. Forests, of which there is no vestige in the Pampas, clothe the mountain slopes of the Andes. In the Pampas running streams are rare, but in the Andes they constitute one of the principal natural features and, gathering in beautiful lakes or in great rivers, determine the future of the region to be one of manufacturing industries based on water-power (Compare the extended and excellent study of this region by Mr. Willis, one of the best of recent works in this field. In several of the following paragraphs a few items of permanent interest from the same source are given, with minor changes).

The mountain chain of the Andes, attaining altitudes of more than 23,300 feet in its highest peaks, has impressed upon the minds of students the idea of an enormous mountain barrier, distinctly separating the lowlands of the Pacific coast from the vast low plains of eastern South America. So fixed is the conception that it has affected the deliberations of statesmen and the relations of nations. The conception of a dividing wall, nowhere easy of passage and in many places impassable, was the fundamental idea according to which the boundary between Argentina and Chile was to have been traced (see CHILE). Throughout the greater part of its extent the conception held true, and the engineers traced a well-defined crest which, following the high summits of the Andes, coincides with the divide of the waters between the Pacific and the Atlantic. But from lat. 38° southward the topographic conditions were found to be very different. In this portion of the Cordillera it spreads out and divides into parallel mountain ranges. Some of the rivers rising in the extreme west of the mountain-belt flow to the Atlantic; others, rising east even of the eastern Cordillera, in the Pampas themselves, flow westward across the entire zone of the Andes to the Pacific. Here was confusion for the treaty-makers, since their engineers discovered, in place of a mountain-wall, a labyrinth of heights and valleys pierced in many places by rivers which wound in zigzag courses, now toward one ocean, now toward another; and a boundary as fixed by a line along the highest crest of the Cordillera was found to diverge widely from a boundary traced on the continental divide between the Atlantic and the Pacific. Fortunately for both Argentina and Chile, the treaty-makers had provided that any dispute should be settled by arbitration. In 1902, after 20 years of discussion, the arbitrator, King Edward of England, gave his award in favor of a compromise line. The foregoing statement makes it evident that the Andes of northern Patagonia constitute not a simple mountain ridge but a broad zone, including both mountains and valleys and traversed by large rivers. The summits whose altitudes most closely approach uniformity have been sculptured by erosion from the broad plateau-like mass of the older rocks of the Andes, whereas most of the isolated peaks which rise more than 7,333 feet above sea are volcanic cones built up on the plateau. The most renowned of these is El Tronador ("The Thunderer"), 11,533 feet above sea, which received its name from Friar Menendez, about 1791, when he described it as the mountain that is always thundering. At the foot of this great peak lies the most profound canyon and lake of the region, that of Nahuel Huapí. This southern division of the Andes may be subdivided into two distinct areas, and the distinction may be expressed in the simple statement that in one the valleys extend east and west across the mountain zone, whereas in the other they range longitudinally from north to south within the Cordillera. The former area comprises the stretch of the Andes from lat. 38° to 41°, from Lago Alumine to Lago Nahuel Huapi. All but one of the streams within it rise in the western Cordillera and flow eastward to join their waters in the Rio Colloncurá and the Rio Limay, which flow in the depression that lies along the eastern base of the Andes. Lago Lacar, though its valley once belonged to this Atlantic family, has turned away and now discharges its waters across the western range down the Pacific slope to the Chilean lakes. In this area high transverse ridges extend eastward between the drain-

age basins, and some of them attain greater elevations near their eastern extremities than at the western. They divide the area into individual basins and more or less effectively obstruct the passage from one to another within the wide belt of the Andean plateau. Where the valley floors range from 2,000 to 2,866 feet in altitude above the sea, one must rise to passes that attain 3,333 or 4,000 feet in order to cross from one valley to the next. Each of the deep transverse valleys harbors one or more lakes, which, like the lakes of Switzerland and northern Italy, lie in deep basins sculptured by the rock-laden ice of glaciers, descending from the adjacent heights. Their shores are everywhere picturesque and in many places precipitous. About their lower eastern ends are piled the glacial moraines of an ice period which is still represented in the little glaciers that linger about the high summits. In each of these valleys, at a distance of several kilometres below the moraines just mentioned, is a much older glacial moraine which marks the outermost limit attained by the ice that filled the valleys during a still earlier glacial epoch. Thus these valleys, descending from the western Cordillera to the lowland that intervenes between the Andes and the high plateaus of the Pampas, range in character from deep gorges in the mountains to beautiful lake basins and wide stretches of gravel plains. Their waters flow in the direction of the western winds, in the direction in which the air currents become dryer as they unload their moisture upon the mountains. The vegetation changes accordingly, and the streams, which gather their headwaters from the deep forest shades of the mountain slopes and which linger in the cold rock-bound lakes of the transverse valleys, flow on in the broad sunlight of the treeless grassy Pampas. Strong historic interests centre about localities in this area. The paso de Villarica, which crosses the Cordillera in the north, was traversed by Francisco de Villagrán in 1553, the year in which Valdivia, the conqueror of Chile, after 12 years of struggle with the Indians, was defeated by them, taken prisoner and killed. Villagrán was undoubtedly the first European to cross the southern Cordillera. Subsequently Spanish captains, missionaries and embassies dispatched to negotiate conditions of peace with the Indians, fought, prayed or held council in the valleys of Lagos Huechulaufquen, Lolog and Lacar.

The section of the Cordillera south of Lago Nahuel Huapí includes a central valley which traverses it from north to south, separating the high western and eastern ranges. From Lago Nahuel Huapí itself a deep pass, which is cut nearly to the level of the lakes, leads to Lago Gutiérrez, whose waters flow by way of Nahuel Huapí to the Atlantic. East of Gutiérrez is the Sierra de la Ventana, and west of it El Catedral, both prominent summits among the Andean heights, yet between them one may pass from Lago Gutiérrez to Lago Mascardi, over a gravel plain which, although it scarcely separates the two lakes, divides the waters of the eastern and western oceans. Here the continental divide descends from El Catedral, passes across the plain between the two lakes, and ascends again to the summit of the Sierra de la Ventana. El Bolsón and its neighbor, the Hoyo de Epuyén, are the deepest valleys in this section of the Andes, lying between 900 and 1,000 feet above the sea and 1,333 feet or more below Lago Mascardi. The temperature naturally changes with the altitude. Frosts, which are common in the northern portion of the central valley, are rare during the summer in El Bolsón, a valley sometimes characterized as a little paradise in the heart of the snowy mountains. In the south rises the mountain group of Cerro Tres Picos and its attendant heights, stretching clear across the mountain zone as a promontory of the western Cordillera. On the east of El Bolsón the continental divide, which follows southward along the summit of the eastern Cordillera, sinks into the Pampas and, swinging eastward outside of the Andes, is marked by the ridge of a glacial moraine surrounding the basin of Cholila. South of the heights of Tres Picos a system of valleys tributary to the Rio Fetaleufu and thus to the Pacific lies between the snowy western Cordillera and the treeless heights of the Cordón de Leleque and the Cordón Esquel, which here represent the eastern Cordillera. The valley zone between the ranges is wider here than farther north, the valleys themselves are in general broader, and the western chain is more dominant as compared with the eastern. Communication across this western range is more difficult than it is farther north, and it has been suggested that this circumstance influenced the arbitrator in tracing the boundary upon the western range and giving the valleys of Cholila, Lago Rivadavia, Lago Fetalaufquen and 16 de Octubre to Argentina. These valleys are rich, fertile and, owing to the bracing mountain climate and pure, swiftly flowing streams, healthful. The Bolsón, the Hoyo de Epuyén, Cholila and 16 de Octubre will support prosperous communities and play an important part in the future development of the Andes.

The population in this essentially borderland far southern division is composed of the varied elements that usually gather on a frontier and cannot be disregarded in planning for the future occupation of the country by a more stable community. Under the treaty of 1881 defining the international boundary, Chile for 20 years laid claim to nearly all the mountain zone of the Andes, and Chileans were encouraged to establish themselves in the area she claimed. It is not difficult for men accustomed to the mountain trails in the forests of southern Chile to cross the passes which lead into the eastern valleys of the Andes. There is along the boundary no conspicuous natural barrier greater than those which the Chilean Indian or half-breed with his active horses and cattle constantly traverses in his own country. Quite naturally, then, the Chilean element is large.

The Andean area which according to Mr. Willis contrasts peculiarly and favorably with other sections of Argentina lies between lat. 38° and lat. 44° and is set apart by such climatic conditions that it may eventually be occupied by energetic people of the temperate zone and become the site of manufacturing industries on a large scale. It is an area of approximately 20,000 square miles, characterized by moderate summer temperatures, cold yet not severe winters, abundant rainfall and such remarkable scenery, that, in brief, it may be called the Argentine Switzerland.

Next, as above promised, we proceed to an

account of the south central division, in which the most interesting region is that extending eastward from the Chilean capital city.

Charles Darwin wrote that the features in the scenery of the Andes which struck him most were: The flat fringes sometimes expanding into narrow plains on each side,— the valleys,— the bright colors, chiefly red and purple, of the utterly bare, and precipitous hills,— the grand and continuous wall-like dikes,— and the strongly marked strata which, when nearly vertical, form the most picturesque and wild pinnacles, but where less inclined, great massive mountains; the latter occupying the outskirts of the range, and the former the central parts;— lastly, the smooth conical piles of fine and bright colored detritus, which slope at a high angle from the flanks of the mountains to their bases, some of the piles having a height of more than 2,000 feet. The quantity of crumbling stone on the Cordillera is very great. Occasionally in the spring masses of such matter slide down the mountains, and cover the snow drifts in the valleys, thus forming natural icehouses the elevation of which may be far below the limit of perpetual congelation.

The Cordillera in this part consists of two principal ranges, the passes across which attain respectively an elevation of 13,210 and 14,365 feet. The first great line (consisting, of course, of many subordinate ones) is called Peuquenes. It divides the waters of Chile and Argentina. To the eastward, a mountainous and elevated region separates it from the second range (called the Portillo) overlooking the Pampas (see article SOUTH AMERICA — *Geology*).

The geological structure of the mountains, at this point of observation, is very briefly sketched, and first that of the Peuquenes or western line; for the constitution of the two ranges is totally different. The lowest stratified rock is a dull red or purple claystone porphyry, of many varieties, alternating with conglomerates, and breccia composed of a similar substance; this formation attains a thickness of more than a mile. Above it there is a grand mass of gypsum, which alternates with, passes into, and is replaced by red sandstone, conglomerates and black calcareous clay-slate. Even at the very crest of the Peuquenes, at the height of 13,210 feet, the black clay-slate contains numerous marine remains, amongst which a gryphæa is the most abundant, likewise shells, resembling turritellæ, terebratulæ and an ammonite. The formation probably is of the age of the central parts of the secondary series of Europe. These great piles of strata have been penetrated, upheaved and overturned, in the most extraordinary manner, by masses of injected rock, equaling mountains in size. On the bare sides of the hills, complicated dikes and wedges of variously-colored porphyries and other stones, are seen traversing the strata in every possible form and direction; proving also, by their intersections, successive periods of violence. The rock which composes the axis of these great lines of dislocation when viewed at a distance resembles granite, but on examination it is found rarely to contain any quartz; and instead of ordinary feldspar, albite. The metamorphic action has been very great, as might have been expected from the close proximity of such grand masses of rock, which were injected when in a liquefied state from heat. When it is known, first, that the stratified porphyries have flowed as streams of submarine lava under an enormous pressure, and that the mechanical beds separating them owe their origin to explosions from the same submarine craters; secondly, that the whole mass in the lower part has generally been so completely fused into one solid rock by metamorphic action that the lines of division can only be traced with much difficulty; and thirdly, that masses of porphyry, undistinguishable by their mineralogical characters from the two first kinds, have been subsequently injected;— the extreme complication of the whole will readily be believed.

We now come in these observations made in the south-central division of the Andes to the second range, which is of even greater altitude than the first. Its nucleus in the section seen by Mr. Darwin when crossing the Portillo Pass consists of magnificent pinnacles of coarsely-crystallized red granite. On the eastern flank a few patches of mica slate still adhere to the unstratified mass; and at the foot a stream of basaltic lava has burst forth at some remote period,— perhaps when the sea covered the wide surface of the Pampas. On the western side of the axis, between the two ranges, laminated fine sandstone has been penetrated by immense granite dikes proceeding from the central mass, and has thus been converted into granular quartz rock. The sandstone is covered by other sedimentary deposits, and these again by a coarse conglomerate of vast thickness. All these coarse mechanical beds dip from the red granite directly toward the Peuquenes range, as if they passed beneath it; though such is not the case. Examination of the pebbles composing this conglomerate (which betray no signs of metamorphic action) disclose perfectly rounded masses of the black calcareous clay-slate with organic remains,— the same rock which is found on the Peuquenes. These phenomena compel us to arrive at the following conclusion: That the Peuquenes existed as dry land for a long period anterior to the formation of the second range, and that, during this period, immense quantities of shingle were accumulated at its submarine flank. The action of a disturbing force then commenced: These more modern deposits were injected by dikes, altered by heat, and tilted toward the line whence, in the form of sediment and pebbles, they had originally proceeded,— thus making the offspring at first appear older than its parent. This second, grand and subsequent line of elevation is parallel to the first and more ancient one.

The central division or "Central Andes"— the name proposed by Mr. Bowman for a group of closely related natural regions that lie between 12° and 26° south latitude — may now, in turn, receive brief attention. Here the dominating features are two great plateaus with a central basin between them. These plateaus, trending north and south, are depicted on the physical maps as two roughly-parallel mountain chains, commonly referred to as the eastern and western [central] Andes. In Bolivia, these east-central Andes are variously designated as the Cordillera Oriental, Cordillera of the East, or the Cordillera Real, the latter being an improper

extension of the specific term applied to the high, white, truly «royal and regal» mountain range near La Paz that is terminated on the south by Illimani and on the north by Sorata. The west-central Andes are usually called the Maritime Cordillera, a generic term applied to the aggregations of individual peaks and short volcanic ranges which surmount the western plateau. In addition, specific terms are applied to the culminating ranges. Thus, on the boundary between Chile and Bolivia, lat. 20° S., there is the Cerro de Sillilica, just as in southern Peru the mountain knot at Vilcanote is called the Cerro de Vilcanote. In the eastern plateau the exceptional heights or the crests of the declivities that border basins and valleys are given such specific names as the Tunari de Cochabamba, Cerro de Cliza and Cordillera de Potosí. Between the two great Andine tablelands and their superimposed peaks and ranges is the central basin or plateau of lower altitude than the bordering highlands, separated from the latter by the two great roughly-parallel scarps of marked rectilinear quality often for long distances. This is the alti-plano of Bolivia: an interior drainage basin, with no visible outlet to the sea, and therefore technically a part of the true desert area of the world. On the north the bordering scarps converge in lat. 14° S., enclosing Lake Titicaca, whose waters discharge by way of the Desaguadero River into Lake Poopó, only to be discharged in turn into the Salar de Coipasa and the adjacent salars to the south. Here and there the otherwise flat basin floor is broken by piles of volcanic detritus, lava flows from occasional centres of igneous activity, or by ancient and highly crumpled sedimentaries, as where the upturned edges of slates and quartzites rib the hills back of the port of Desaguadero. East of the central Andes, as indeed along the whole eastern front of the Andine Cordillera, from the Argentine Pampas to the Llanos of Venezuela, the dissection of the adjacent highlands has been accompanied by the formation of extensive piedmont deposits. The western plateau descends by a relatively smooth slope to the coastal deserts of Tarapacá and Atacamá. Between these deserts and the Pacific shore are low mountain ranges of complex geologic and physiographic character, the coast ranges of Chile and Peru.

A generalization by Mr. Bowman is to the effect that, in the field of human geography, the central Andes form an exceedingly important group. It is impossible to find elsewhere in South America an area of equal size with so great a variety of life. The density of population ranges from 100 to the square mile in the vicinity of Cochabamba, Bolivia, to one-tenth to the square mile in the Territorio de los Andes, Argentina. Occupations vary between such extremes as, on the one hand, the intensive agriculture of irrigated valleys, and on the other the pastoral nomadism of Alpine meadows; customs are, in one place, those of modern civilized people, but, in another, those that bespeak an unmixed barbarism. It is the extremely wide range in the physical conditions of the central Andes that excites the interest of the geographer. The principles of geographic science rest upon the theory that man is to an important degree the product of the earth. In the varied physical environment of this great tract we should therefore expect climate and relief to exercise a high degree of influence upon the population. A study of its people should demonstrate both the scientific nature of geography and the wide application of its laws.

The fourth division, according to the order we are following from south to north, is the equatorial; and here we notice the points in which this region is sharply differentiated from the other divisions. Edward Whymper, the distinguished explorer, in his 'Travels' wrote: "In a very short time it was found that there were things to be *unlearned* as well as discovered in Ecuador. We ascertained that Chimborazo streamed with glaciers, although high authorities state that it has none; and in course of time it became apparent that the two 'parallel Cordilleras,' which according to geographers are the great feature of the country, do not exist." By an equatorial belt, so to speak, the parallel cordilleras observed hitherto (in this article) are constricted. But these soon diverge above the line, and more than reassert their individualism before yielding to that powerful eastern impulse which we have already mentioned in the first paragraph. The axis of the Andes in Ecuador runs nearly north and south; and toward the western edge of the main chain there is indeed, this author admits, a certain sequence of peaks more or less in a line. East of these summits there is a succession of basins of different dimensions and at various elevations. The nearest mountains on the eastern side occur at irregular distances. There is no such thing as one great valley in the interior of Ecuador. The mountains Pasochoa and Rumiñahui are the only two which lie parallel to the others on the western side. All of the great Andes of the equator rise out of, or upon and above, the main chain, which was created by upheaval at some remote date (compare what has been said above in respect to time). With the exception of Sarauru, they are all mountains of volcanic origin, although they may not all have been active volcanoes. It seems probable that there were never many of these volcanoes in activity at any one moment. Some that are now extinct have evidently been alive; while others, like Pichincha and Tunguragua, are either dormant or are not perpetually in eruption. Cotopaxi and Sangai alone are in a state of constant activity, and these two mountains seem to be increasing their elevation. Cotopaxi shows no signs of approaching decrepitude, and for many centuries yet to come it may remain the highest active volcano in the world. In general the altitudes here are less by several thousand feet than those of the highest peaks in Chile and Bolivia. Of the extinct volcanoes, Cayambe, Antisana and Chimborazo are the most important. There are no records of eruptions of Chimborazo. It must have been an extinct volcano for many ages. The complete burial of its crater, the thickness of the ice-cap at its summit and the large size of its glaciers, the ruin and erosion of its lava-streams and the height vegetation has attained upon its flanks, are all indications that its activity ceased at a remote period. Particularly interesting are the observations of temperatures on summits in Ecuador. On 4 January at 5:15 P. M. the temperature on the summit of Chimborazo (height 20,498 feet)

was found to be 21° F., while at Guayaquil (6 P. M. on the same day) it was 85° F. On 18 February at 6:20 A. M. the temperature on the summit of Cotopaxi (height 19,613 feet) was 21° F. At Guayaquil on the same day at 11 A. M. the temperature was 82° F. On 10 March at 10–11:40 A. M. the temperature on the summit of Antisana (19,335 feet) was 44°–60° F., while at Guayaquil on the same day at 11 A. M. it was 80° F. In each case the observations were, of course, of temperatures in the shade.

The fifth division, the northern, might also be called northern and northeastern. We have already, by anticipation and quite unavoidably, given main facts touching the partition and trend of the Andes in the region between the equator and lat. 12° N. Humboldt described the eastern Cordillera of Colombia — the chain which stretches toward Bogotá; the chain which lies between the Magdalena and the Cauca, which he called the central Cordillera of New Granada (Colombia); and the chain which continues the Cordillera de la Costa from the basin of Almaguer, which he designated the Western Cordillera of this northern division. This tripartition of the Andes (lat. 1¾°–2¼° N.) resembles that which takes place in the knot of the mountains of Huanuco and Pasco in lat. 11° S.; but the most western of the three chains that bound the basins of the Amazon and the Huallago is the loftiest; while that of the shore (the Western Cordillera) is the least elevated of the three chains of the Republic of Colombia. The eastern chain of the Andes of Colombia preserves its parallelism with the other two for a considerable distance; but beyond Tunja, in lat. 5½° N., it inclines more toward the northeast, passing somewhat abruptly from the direction N. 25° E. to that of N. 45° E. It is like a vein that changes its direction. The tripartition of the Cordilleras, and, above all, the spreading of their branches, have a vast influence upon the prosperity of the inhabitants. The diversity of the superposed table-lands and climates gives variety to the agricultural productions as well as to the character of the people.

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MARRION WILCOX.

ANDES AND THE AMAZON, The, a volume of travels by James Orton (1870, enlarged ed. 1876). Under the auspices of the Smithsonian Institution, the author, who for many years was professor of natural history at Vassar College, led an exploring expedition to the equatorial Andes and the river Amazon. Its experiences are set forth in this work.

ANDESINE, ăn'dēz-ĭn, a triclinic feldspar, intermediate in composition between albite and anorthite. Albite and anorthite are isomorphous, and andesine includes those mixtures of the two in which the ratio of albite to andesine ranges from 1:1 to 3:2. Andesine may be described as an anhydrous silicate of sodium, aluminum and calcium. Its hardness is from 5 to 6 and its specific gravity about 2.68. In color it is white, gray, greenish, yellowish or pink. It was first found in the Andes (whence the name), but has since been observed in Alsace, in Iceland and in other localities. In the United States it occurs at Sanford, Me.

ANDESITE, ăn'dēz-īt, a common volcanic rock, consisting of a triclinic feldspar (such as andesine) mixed with hornblende or augite and sometimes also with quartz. It varies in color from green to gray and occasionally has a purplish cast. It is difficult to define andesite accurately because basalt, andesite and trachyte are similar in composition, and intermediate varieties exist, which, with the typical rocks of the three classes, form an almost continuous series. Andesite is more fusible than trachyte, but less fusible than basalt.

ANDIRA, ăn-dī'rà, a genus of leguminous typical American trees, with fleshy plum-like fruits. The wood is well fitted for building. The bark of *A. inermis*, or cabbage-tree, is narcotic, and is used as an anthelminthic under the name of worm bark or cabbage bark. The powdered bark of *A. araroba* is employed as a remedy in certain skin diseases, as herpes.

ANDIZHAN, ăn'dĭ-jăn', Russia, city and capital of the district of the same name, in the province of Ferghana, Russian Turkestan, 42 miles from Margelan, the provincial capital. Andizhan is the eastern terminus of the Transcaucasian Railroad. It is the centre of an immense cotton-raising district, whence Russia received three-fourths of all the cotton used in the empire. It came into the possession of Russia in 1875. In 1902 the city was totally destroyed by an earthquake which killed over 5,000 of the 47,000 inhabitants. In 1916 it had 82,235 inhabitants.

ANDOCIDES, ăn'dŏs'ĭ-dēz, an Athenian orator: b. 467 B.C.; d. about 393 B.C. Active in public affairs, he was four times exiled; the first time along with Alcibiades, for profaning the Eleusinian mysteries. Three of his orations are extant.

ANDORRA, ăn-dŏr'rà, a small republic in the eastern Pyrenees between Ariège, a department of France, and Lérida, a province of Spain. It is about 80 miles west from the Mediterranean coast and 100 miles north of Barcelona. Its area is 175 square miles and the population 5,231. It is under the joint suzerainty of France and the Spanish bishop of Urgel. It is governed by a council of 24 members elected for four years by the heads of families in each of its six parishes. The council elect a first and second syndic to preside; the executive power is vested in the first syndic, while the judicial power is exercised by a civil judge and two magistrates (viguiers). France and the bishop of Urgel appoint each a magistrate and a civil judge alternately. A permanent delegate, the prefect of the Pyrénées-Orientales, moreover, has charge of the interests of France in the republic. The Andorra valley is enclosed by mountains. There is excellent pasture land, on which cattle are raised. Fruit trees and vines also flourish, and iron and lead are mined in the mountains. Much of the grain of the republic comes from France. The manufacture of coarse cloth is the chief industry. Wool, ores, cloth and dairy products are exported in small quantities. Andorra received its independence from Charlemagne in recognition for its services to him in his campaign against the Moors, and in 1278 was transferred to the Comte de Foix and the bishop of Urgel. During the French Revolution the French declined the annual tribute from Andorra, but in 1806 the former relations with France were resumed and cereals from France were admitted free in consideration of an annual payment of 960 francs. The bishop of Urgel receives an annual sum of 460 francs. Military service is compulsory for all citizens between the ages of 16 and 60. The capital is Andorra with a population of 1,000. Consult Deverell, 'History of the Republic of Andorra' (Bristol 1885); Johnson, V. W., 'Two Quaint Republics, Andorra and San Marino' (Boston 1913); Spender, H., 'Through the High Pyrenees' (London 1898); Tucker, 'The Valley of Andorra' (Cambridge, Mass., 1882).

ANDOVER, England, a market town in Hampshire, on the river Anton, 12 miles west of Winchester. Its large parish church was built about 1850 on the site of a Norman predecessor. The Massachusetts Andover was named in honor of the Hampshire town. It manufactures iron and malt. There are remains of Roman villas in the neighborhood. Pop. (1911) 7,596.

ANDOVER, Mass., town in Essex County, including several villages south of the Merrimac, 22 miles north of Boston, on the Boston & Maine Railroad, and on the Shawsheen River. It is the seat of the Phillips Academy for boys, founded in 1778, and of the Abbot Academy for young ladies. It has a public library. The government is administered through town meetings, at which three selectmen are selected as executive officers, appropriations made and other civic affairs attended to. Andover was first settled in 1643 and was incorporated three years later. During the witchcraft agitation, in 1692, three citizens of Andover were executed at Salem and several others placed on trial and acquitted. On 5 March 1698 it was attacked by Indians, who slaughtered five of the citizens and set fire to a number of buildings. Andover has manufactories of linen, twine, shoe-thread, woolen goods, ink, brushes, tubes and rubber goods. Pop. (1910) 7,301. Consult Abbot, 'History of Andover' (Andover 1829) and Bailey, 'Historical Sketches of Andover' (Boston 1880).

ANDOVER THEOLOGICAL SEMINARY, Cambridge, Mass., the oldest theological institution in New England, founded in 1807 and opened for instruction the following year, at Andover, Mass. The original founders were Samuel Abbot, Mme. Phoebe Phillips and her son John P. of Andover. The associate founders were William Bartlet and Moses Brown of Newburyport, and John Norris of Salem. The primary aim of the founders was to provide for the professional education of ministers for the orthodox Congregational churches, and, in pursuance of this aim, men of different theological views (Old Calvinist and Hopkinsian) united upon a common platform. The constitution sets forth a comprehensive plan of instruction in all branches of Christian learning, and from the first the seminary was able to offer a more thorough preparation for the ministry than was then obtainable elsewhere in this country. Among the professors have been Leonard Woods, Moses Stuart, Ebenezer Porter, Edward A. Park, Austin Phelps, Joseph Henry Thayer, Egbert C. Smyth, and William J. Tucker. In 1908 the seminary celebrated its centenary with appropriate exercises. At that time it had given instruction to more than 3,500 students and had sent out 2,172 graduates. The same year the seminary was removed to Cambridge and affiliated with Harvard University, although retaining its own faculty and its separate corporate existence. Instruction is freely interchanged between the two institutions, and the libraries have been combined into one, the Andover-Harvard Theological Library, which contains about 107,000 volumes and 51,000 pamphlets. The total endowment of the seminary, including lands and buildings, is about $1,000,000. The seminary is open to all Protestants without discrimination. Only college graduates are eligible for the degree of bachelor of divinity. The annual tuition fee is $150, which entitles the students to admission to Andover and Harvard courses alike. The faculty consists of six professors (1916). For the early history of the seminary consult Leonard Woods' 'History of the Andover Theological Seminary' (Boston 1885).

ANDRADA Y SYLVA, ăn-drā'da ē sil'va, **Bonifacio José D',** Brazilian statesman: b. Villa de Santos 1765; d. Nictheroy 1838. In 1800 he was appointed professor of geology at Coimbra, and soon after inspector-general of the Portuguese mines and in 1812 he was made perpetual secretary of the Academy of Lisbon. Returning to Brazil in 1819, he urged Dom Pedro I to resist the recall of the Lisbon court and was appointed one of his ministers in 1821.

When the independence of Brazil was declared Andrada was made Minister of the Interior and of Foreign Affairs; and when it was established he was again elected by the Constituent Assembly, but his democratic principles resulted in his dismissal from office, July 1823. On the dissolution of the Assembly in November 1823, he was arrested and banished to France, where he lived in exile near Bordeaux till, in 1829, he was permitted to return to Brazil. But being again arrested in 1833, and tried for intriguing on behalf of Dom Pedro I, he passed the rest of his days in retirement.

ANDRADITE (named for the Portuguese mineralogist, d'Andrada), the common or black garnet. See GARNET.

ANDRAL, än'dral', **Gabriel,** French physician and pathologist: b. Paris, 6 Nov. 1797; d. 13 Feb. 1876. In 1827 he was called to the chair of hygiene, in 1830 to that of pathology in the University of Paris. Andral may be said to have been the first to apply an analytical and inductive method to pathology. His 'Medical Clinic' (1824) established his reputation, and his 'Summary of Pathological Anatomy' (1829) was equally successful. Other works of importance are his 'Essay on Pathological Hæmatology' (1843); 'Course in Pathology — Interne' (1836–37); and 'Investigations into the Modification of the Relative Proportions of Hæmatic (Blood) Principles'; 'Traité élémentaire de pathologie et de thérapeutique générale' (1843).

ANDRASSY, än-dräsh'ē, the name of an Hungarian noble family bearing the title of Gróf (German, "Graf"), equivalent to "count" or "earl." The full name is "Andrassy von Csik-Szent-Király und Kraszna-Horka." The founder of the family was Andorás, one of the leaders in the Magyar immigration in the 9th century. There are two branches of the family, which received its patent of nobility in 1779. Several Andrassys played more or less important parts in politics and literature. The most distinguished member of the family was Count Julius Andrassy (q.v.), who died in 1890.

ANDRASSY, än'drä-shĭ, **Julius,** COUNT, Hungarian statesman: b. Zempben, 8 March 1823; d. 18 Feb. 1890. He took part in the Revolution of 1848 and was condemned to death, but escaped and went into exile. Appointed Premier when self-government was restored to Hungary in 1867, he became Imperial Minister for Foreign Affairs in 1871; drew up the famous Andrassy note to the Porte in 1876; was a conspicuous member of the Congress of Berlin in 1878; negotiated the German-Austrian alliance with Bismarck in 1879, retiring the same year from public life. The Andrassy "Note" was a declaration relating to the disturbed condition of Bosnia and Herzegovina, formulated by the governments of Austria, Russia and Germany, with the approval of England and France. It commanded the establishment of religious liberty, the application of local revenues to local purposes, and other reforms, and was formally presented to the Porte, 31 Jan. 1876.

ANDRASSY, Julius, COUNT, 2d son of the preceding; Hungarian statesman: b. 30 June 1860. As a young man he was *attaché* to the Austro-Hungarian embassies in Berlin and Constantinople, became "resident officer" in a hussar regiment and was elected to the Hungarian Reichstag in 1884. He was nominated under-secretary in the Department of the Interior in 1892, Minister of Education in 1893, and Minister at the Royal Court in 1894. On the resignation of the Wekerle Liberal Cabinet in December 1894, Baron Banffy became Premier, and Andrassy retired from office. Banffy's stormy tenure of office ended in February 1899, on which Andrassy returned to the ranks of the Liberal party after having seceded from it the previous year. He supported in turn the Szell, Hédervary and Tisza administrations, the last of which he assisted to wreck in 1905. The Emperor-King (the late Francis Joseph) invited Count Andrassy to form a new ministry, but the sovereign firmly declined to make the concessions which Andrassy considered indispensable, the chief of which was the adoption of the Hungarian language of command in the Hungarian portion of the Dual army. All efforts to form an Andrassy ministry failed; the monarch spent 16 days in Budapest vainly endeavoring to settle the crisis. Count Stephen Tisza, though out of office from 1 Feb. 1905, continued to act as Premier till May, begging to be relieved of the duties. Representing the coalition leaders, Count Adrassy visited the Emperor at Vienna to set forth the Hungarian program; being told that further military concessions were impossible, he withdrew from the negotiations, and Baron Fejervary became Premier, but tendered his resignation a few days later. In January 1906 the Emperor and Andrassy met to discuss the claims of the coalition; the terms demanded by the latter were rejected, the Diet was dissolved and the Parliament building cleared by troops. In the end Dr. Wekerle returned to power with a coalition or compromise cabinet in which Andrassy became Minister of the Interior, holding the office till September 1909. He was then offered the premiership, but refused it; in 1911 he went over to the opposition in the Chamber. At the outbreak of the European War Count Stephen Tisza — who with Count Berchtold was largely responsible for Austria's aggressive policy against Serbia — again held the reins of office. Andrassy, Apponyi and Karolyi, the leaders of the so-called "Independence Party," strongly supported Tisza's war policy; in July 1916, however, a section led by Count Karolyi broke away from that policy, the latter having quarreled with Andrassy and Apponyi. This notable move represented the very first break away from the Teutonic war policy by any non-Socialist party of either of the two dominant Central Powers. President Wilson's reply to the German peace proposals in February 1917 led Andrassy to assert in a newspaper article that Austria and her allies could not accept any demands which would result in a dismemberment of the Dual Monarchy. He and Count Apponyi interposed a determined "no" when Tisza expressed himself still willing to negotiate for peace with the Allies. In April, Andrassy engineered a movement to boycott Tisza for refusing to consider voting reforms. He scoffed at the Premier's offer of cabinet posts to members of the opposition. Count Apponyi supported the agitation and when, in May 1917, the Emperor Charles refused his assent to the franchise proposals of

Count Tisza, the latter resigned and Andrassy was entrusted with the formation of a new Hungarian cabinet, 29 May 1917.

Count Andrassy is credited with pro-British sentiments; he speaks excellent English, cares nothing for public opinion, and is deeply engrossed at all times in history and constitutional law. Honesty in politics is said to be a passion with him. He has written a great many newspaper and magazine articles in French, German and English, as well as in his native tongue, and published two important works, 'Ungarns Ausgleich mit Oesterreich vom Jahre 1867' (1897), and 'The Development of Hungarian Constitutional Liberty,' of which an English translation appeared in London (1908).

ANDRASSY NOTE, a memorandum drawn up by Count Andrassy (q.v.) on behalf of Austria, Germany and Russia, and presented to the Turkish government in December 1875. It set out certain reforms, which the Porte accepted with one exception, as a means of checking the revolt of the Sultan's European subjects. The British government supported the note. See BERLIN MEMORANDUM.

ANDRÉ, ăn'drā or ăn'drĭ, **Charles**, French astronomer: b. Chauny 1842. In 1877 he was appointed professor of astronomy at Lyons and director of the observatory in that city, for which he visited the Rocky Mountains and Australia to observe Venus in transit. He is the author of 'L'astronomic pratique et les observations en Europe et Amérique depuis le milieu du XVIIe siècle jusqu'à nos jours' (1874–82).

ANDRÉ, John, British soldier: b. London, of Swiss-French parentage, 1751; executed at Tappan, N. Y., 2 Oct. 1780. His fate is peculiar; failure has given him a monument in Westminster Abbey from his own side, and undying romantic pity from the other; where success would have loaded him with infamy from the one, and made the other glad to forget him. He entered the English army at 20, and was sent to Canada in 1774; November 1775 he was taken prisoner at Saint John's by Montgomery's expedition and sent to Lancaster, Pa. Exchanged in December 1776, he was made captain in 1777, aide to Gen. Charles Grey, major in 1778, and in 1779 aide to Clinton and adjutant-general of the forces in America. He owed this rapid advancement, as he has owed his enshrinement by posterity, to his extraordinary and somewhat feminine charm of person and manner, which won the hearts not only of his chiefs and associates, but of the very officers who put him to death. He was full of wit and vivacity, a most entertaining companion, a good amateur musician and artist and a fluent, pleasing writer, and his literary qualities led to his selection as Clinton's adjutant and secretary. He was also a fair society poet, known in London literary circles; and his casual skits in verse, 'The Cow Chase,' 'Yankee Doodle's Expedition to Rhode Island,' 'The Affair Between Generals Howe and Gadsden,' etc., were great favorites in the English army. During that army's winter in Philadelphia, 1777–78, André was the promoter of and a chief actor in all the festal occasions and social events, including the 'Mischianza,' a pageant in honor of Howe on his departure. In 1780 it fell to his official duty to conduct Clinton's negotiations with Benedict Arnold (q.v.) for the betrayal of West Point, the key of the Hudson, the command of which Arnold had solicited in order to betray it. Both sides were wary and suspicious of each other, and Clinton was uncertain of his correspondent's identity or whether the affair might not be a trap. After various abortive attempts at a secret interview, André, on 19 September, went as "John Anderson" up the Hudson in the sloop-of-war Vulture, nearly to the American lines above Fort Montgomery. The plan was to meet under a flag of truce, on pretense of arranging as to the confiscated property of the loyalist Col. Beverley Robinson, whose house was Arnold's headquarters; but this too failed, and finally on the night of 21 September Arnold induced a loyalist farmer, Joshua Smith, to carry a packet from Robinson to "Anderson" on the Vulture. André returned with Smith, was met on the shore by Arnold, and after a private conference the two went to Smith's house, where they spent the night and part of the next day arranging the betrayal, which was fixed for the day of Washington's expected return. Arnold gave him six papers containing drawings of the West Point defenses and full information concerning them, and passes to return to New York either by land or water. He also sent Smith as escort, charged not to leave André till he had reached the English lines in safety. But in the morning the American batteries had fired on the Vulture and driven her so far down stream that the boatmen would not carry him to her. André, therefore, disguising himself as a civilian, set out on horseback, carrying the papers in his boots. Smith, despite Arnold's injunction, left André on the way, probably in fear for himself. About 9 A.M. on the 23d, near Tarrytown, and almost in sight of the British lines, he was stopped by three patriot militiamen, John Paulding, David Williams and Isaac Van Wart. Supposing them to be Tory "cowboys," he told them he was an English officer, and offered them money. Finding that they were not loyalists, he offered more money and his horse in addition, showing also Arnold's pass. Their suspicions thoroughly aroused, they searched him, found the papers and carried him to one Lieutenant-Colonel Jamison, who, not suspecting treachery on Arnold's part, notified him of the capture and proposed to hand the prisoner over to him. This gleam of hope was delusive, and André was finally sent to Washington, while Arnold fled to the Vulture and saved his own life. By military law André was, of course, subject to immediate hanging; but in consideration of his rank, Washington on 29 September convened a military court of six major-generals and eight brigadier-generals, with Gen. Nathanael Greene as president, who unanimously convicted him of being a spy and sentenced him to death on 2 October. Clinton did his best to save André, protesting that he was not a spy because he was under a flag of truce (which was false), and that his movements were in obedience to the directions of Arnold, an American commander, —a grimly humorous defense under the circumstances; but Washington replied with firm courtesy that the circumstances justified no exception to the rules of war. André died like a man and need not be grudged our pity; but he

was treated with a generous humanity curiously in contrast with the treatment accorded to Nathan Hale.

A monument to André was placed in Westminster Abbey, and in 1821 his remains were taken up and reburied near it. Consult Sparks, 'Life of André' (in 'American Biographies'); Sargent, 'Life of André' (1862); Lossing, 'Two Spies' (1886). Lord Mahon in his 'History of England' assumes Clinton's case for André as good both in law and in equity. In 1858 Charles J. Biddle, a Philadelphia editor and ex-soldier, reviewed Mahon's opinions before the Pennsylvania Historical Society. Consult its 'Memoirs,' Vol. VI. For documents consult H. W. Smith's 'Andréana' (1865); Dawson's 'Collection' (1866). André's *Journal* was printed by the Bibliophile Society in Boston in 1904.

ANDRÉ, Louis Joseph Nicolas, a French military officer: b. Nuits, Burgundy, 29 March 1838; d. Dijon, France, 18 March 1913. He was graduated at the Polytechnic School, and in 1865 became captain, serving in that capacity throughout the Franco-Prussian War of 1870–71. He was made general of brigade in 1893 and placed in charge of the Polytechnic School. On 29 May 1900 he was appointed Minister of War by President Loubet, succeeding General the Marquis de Gallifet, who held the office during the exciting period of the Dreyfus revision.

ANDRÉ, Saint Jacques d'Albon, Marquis of Fronsac, generally known as Maréchal de Saint André, a French nobleman, made gentleman of the bedchamber by Henry II. In 1550 he was deputed to bear the collar of his order to Henry VIII of England, by whom he was invested with that of the Garter. On his return he was appointed to the command of the army in Champagne, where he greatly distinguished himself till taken prisoner at the battle of Saint Quentin. On the death of Henry II he was chosen one of the regency. Killed at the battle of Dreux in 1562. The Huguenots called Saint André «The Harquebusier of the West.»

ANDREÄ, Jakob, a German Protestant theologian: b. Waiblingen, 25 March 1528; d. Tübingen, 7 Jan. 1590; became professor of theology and chancellor of the University of Tübingen in 1562, and was the author of over 150 works, nearly all of a polemical character, besides being the chief author of the 'Formula Concordiæ.'

ANDREÄ, Johann Valentin, a German theologian: b. Herrenberg 1586, near Tübingen; d. Stuttgart 1654. He studied at Tübingen, became a Protestant pastor, and was chaplain to the court at Stuttgart. Eminently practical in mind, he was grieved to see the principles of Christianity made the subject of mere empty disputations, and accordingly devoted his life to the correction of this tendency of his age. His writings are remarkable for the wit and humor as well as for the acuteness and moral power which they display. He was long regarded as the founder or restorer of the order of the Rosicrucians, a view based on his quaint but misunderstood 'Chemical Jubilee of Christian Rozenkreuz' (1616). But his intention was certainly not to originate or promote a secret society of mystics, but to ridicule the follies of the age, including the theosophic Rosicrucians. He wrote mainly in Latin, but also in the Suabian dialect. Among the best of his works are his 'Menippus, or a Hundred Satyric Dialogues' (1617), and his 'Spiritual (Clerical) Relaxation' (1619).

ANDREA CHENIER, an opera in four acts by Umberto Giordano; libretto by Luigi Illica; first performance, Milan, 28 March 1896; in New York, 13 Nov. 1896. The scene is laid in Paris during the French Revolution, and the story is woven around a real person, a poet and patriot named Andrea Chenier, born in Constantinople, who was studying in Paris when the revolution broke out. He was guillotined 25 July 1794. The first scene reveals the hall in the castle of the Countess de Coigny (whose daughter, Madeleine, is the heroine of the piece). Among the servants, who are making preparations for a grand ball, is one Gerard, who afterward becomes the leader of the revolution. Chenier, the poet, arrives with the guests, and is requested by Madeleine to improvise a song of love. Instead, however, the poet improvises a violent diatribe against the aristocracy, which naturally displeases the haughty guests. Gerard leads in a crowd of poor, starving people, who look very much out of place amid the gorgeous surroundings. Gerard and the crowd are ordered out, and Chenier exhibits his sympathy by following them. Five years have elapsed between the first and second acts. The latter opens with a café near the Seine. Andrea is seated outside at a table; at another table sit a spy and Madeleine's maid, Bersi. Roucher, a friend, warns Chenier that he is in danger and gives him a pass that will carry him to safety. Bersi, the maid, tells Chenier to wait for a lady, who turns out to be the fair Madeleine. She beseeches Chenier to save her from the dreaded power of Gerard, who suddenly appears and attempts to seize the girl. Roucher intervenes and escorts the girl away, leaving Gerard and Chenier to fight a duel, in which Gerard is wounded. Gerard gallantly warns his rival that he is proscribed and implores him to save Madeleine. Chenier hurries away and Gerard disclaims any knowledge of the man who had struck him down. In the third scene, the Tribunal, Gerard is told of Chenier's arrest and is urged to denounce him, which he reluctantly does by signing the warrant. Madeleine offers her own life to save that of Chenier, and Gerard relents. But it is too late; he has signed the paper and Chenier is sentenced to death. Act IV. Chenier is writing verses in his cell, which Madeleine enters through bribing the jailer. Gerard makes a final but ineffective appeal to Robespierre, and in the morning the two lovers go to the guillotine together.

ANDREA DEL SARTO, one of Browning's most famous dramatic monologues, is founded upon the life of the Italian painter as given in Vasari's 'Lives,' and is an attempt to explain the meaning of the portrait that del Sarto painted of himself and his wife, Lucrezia, which now hangs in the Pitti Gallery at Florence. The poem comprises 272 lines of blank verse, and was first printed in the second volume of 'Men and Women' in 1855. Andrea, though called the «faultless painter» by his contemporaries, lacked some essential quality (according to Browning, elevation of mind,

aspiration) that enabled such painters as Michelangelo, Raphael, and Leonardo, though inferior in technique, to surpass him. Browning finds in Andrea's infatuation with Lucrezia, which has led to sacrifice of character and artistic ideals, the key to this defect. This is brought out as the painter discusses himself and his art in a monologue addressed to his wife, as the two are seated in the dusk at a window of his house looking toward Fiesole. The poem is a three-sided study of character: of an artist who has failed to attain his ideal and who knows why he has failed; of a man who has lost his self-respect; and of a lover who has given his all without return; and yet this artist, man, and lover, though disillusioned and hopeless, is content. The theory of art implied in the poem grows out of the character portrayal and is incidental to it; and, as is usual with Browning, this philosophic element is rendered human and "dramatic" as the natural utterance of the speaker under the given circumstances. The quiet and restrained style of the monologue, easy and colloquial, reflects the mood of the speaker and seems colored by the autumnal silver-gray of the outer world. Few poems leave so profound and distinct an impression; few are so subtle and so rich in suggestion. As a picture of Renaissance life and character, Andrea del Sarto should be read in connection with its companion piece, Fra Lippo Lippi, to which it forms an utter contrast. In such studies Browning shows himself not only the greatest master of the dramatic monologue, but also of all poets the most profound student of the Renaissance, and the most successful in making poetry out of the subjects with which it provided him. Among the many criticisms of Andrea del Sarto may be mentioned that given by Mrs. Orr in her 'Handbook'; by George Willis Cooke, in his 'Browning Guide-Book,' and by Albert Fleming, 'Browning Society Papers' (No. 8, 2:9).

MARION TUCKER,
Professor of English Literature, Polytechnic Institute of Brooklyn.

ANDREANI, än'drā-ä'nė, **Andrea,** Italian wood engraver: b. Mantua about 1560; d. there 1623. He worked in Florence, Siena and Mantua. He excelled in chiaroscuro engraving, of which he is one of the world's greatest masters. His arrangement of light and shade was remarkable, as also his drawing. His works include 'Pavement of Siena Cathedral'; 'The Deluge,' and 'The Destruction of Pharaoh's Host,' both after Titian and Mantegna's 'Triumph of Caesar' (10 prints, 1598), which is considered his best work. His monogram is often confounded for that of Albrecht Altdorfer.

ANDREASBERG, än-drā'äs-bĕrg, Prussia, a mining town in the province of Hanover, 57 miles southeast of the town of Hanover and 14 miles from Klausthal, on a site 1,800 feet above sea-level, a little to the southwest of the Brocken. The minerals obtained in the mines of the district are silver, copper, cobalt, lead, arsenic, etc. The Samson shaft, 2,950 feet deep, is the deepest mine in the Harz Mountains. Pop. 4,600.

ANDREE, än'dra, **Karl,** German geographer: b. Brunswick, 20 Oct. 1808; d. Wildungen, 10 Aug. 1875. He was educated at Jena, Göttingen and Berlin. After having been implicated in a students' political agitation he became a journalist, and in 1851 founded the *Bremer Handelsblatt.* From 1855, however, he devoted himself entirely to geography and ethnography, working successively at Leipzig and at Dresden. In 1862 he founded the important geographical periodical *Globus.* His works include 'Nordamerika in Geographischen und Geschichtlichen Umrissen' (1854); 'Geographische Wanderungen' (1859); and 'Geographie des Welthandels' (1867–72).

ANDREE, än'dra, **Richard,** German ethnographer and geographer: b. Brunswick 1835; d. 1909. He was educated at Leipzig. In 1859–63 while studying the German–Czech race conflict, he was employed as a foundryman in Bohemia. He edited the *Globus* from 1891 to 1903. He was appointed professor at the University of Munich in 1902. Among his works are 'Nationalitätsverhaltnisse und Sprachgrenze in Böhmen' (1870); 'Tschechische Gänge' (1872); 'Zur Volkskunde der Juden' (1881); 'Die Metalle bei den Naturvölkern' (1884); 'Die Masken in der Völkerkunde' (1886); 'Die Flutsagen' (1891), and 'Braunschweiger Volkskunde' (1896).

ANDREE, Salomon Auguste, Swedish aëronaut: b. in Grenna, 18 Oct. 1854; date of death unknown. He was educated in Stockholm. In 1882 he took part in a Swedish meterological expedition to Spitzbergen. In 1884 he was appointed chief engineer to the Patent Office, and from 1886 to 1889 he occupied a professor's chair at Stockholm. In 1892 he received from the Swedish Academy of Sciences a subvention for the purpose of undertaking scientific aërial navigation. From that time he devoted himself to aërial navigation, making his first ascent at Stockholm in the summer of 1893. In 1895 he presented to the Academy of Sciences a well-matured project for exploring the regions of the North Pole with the aid of a balloon at an estimated cost of about $40,000. A national subscription was opened, which was completed in a few days, the King of Sweden contributing the sum of $8,280. With two companions, Dr. S. T. Strindberg and Herr Fraenckell, Andree started from Dane's Island, Spitzbergen, 11 July 1897. His balloon was 67¼ feet in diameter, with a capacity of 170,000 cubic feet. Its speed was estimated at from 12 to 15 miles an hour, at which rate the Pole should have been reached in six days provided a favorable and constant wind had been blowing. Two days after his departure a message was received from Dr. Andree by carrier pigeon, which stated that at noon, 13 July, they were in lat. 82.2° and long. 15.5° E., and making good progress to the east, 10° southerly. Several expeditions sent in search of Andree have returned without obtaining any further intelligence of the explorer.

ANDREINI, än'drą-ē'nę, **Giovanni Battista,** Italian comedian and poet: b. Florence, 1578; d. Paris, about 1650. From his sacred drama, 'Adam' (1613), Milton is by some supposed to have derived the idea of 'Paradise Lost.'

ANDREOLITE, än'drē-ō'lit (from Andreasberg, in the Harz Mountains), a mineral better known as harmotome (q.v.). The name

andreolite should be retained for it according to the law of priority; but mineralogists have preferred to adopt the name harmotome, as given by Haüy, although no good reason can be assigned for so doing.

ANDREOSSY, än'drą'ǫ'se', **Antoine François,** COUNT, French general and statesman: b. Castelnaudary in Languedoc, 6 March 1761; d. Montaubon, 10 Sept. 1828. He entered the artillery in 1781, joined the revolutionists, served under Bonaparte in Italy and Egypt, and took part in the revolution of the 18th Brumaire. He was Ambassador at London, at Vienna and at Constantinople, from which latter post he was recalled at the restoration. He was raised to the peerage by Napoleon after his return from Elba. After Waterloo he advocated the recall of the Bourbons, but, as deputy, generally took part with the Opposition. He was elected to the Academy in 1826. He was a man of eminent scientific attainments, one of his earliest works being the 'Histoire Générale du Canal du Midi' (1800). Besides his scientific works he wrote several military «Memoirs.»

ANDREW, a Neapolitan king, assassinated with the connivance of his queen in 1345.

ANDREW, James Osgood, American Methodist bishop: b. Wilkes County, Ga., 3 May 1794; d. Mobile, 1 March 1871. He was an itinerant preacher in South Carolina from 1816 till consecrated bishop, 1832. His social relations were the immediate cause of the division of the Methodist Episcopal Church into «North» and «South.» His second wife whom he married in 1844 was a slave holder; and the General Conference of that year resolved that he should «desist from the exercise of his office» on the ground that the fact of his wife's owning slaves «would greatly embarrass if not in some places entirely prevent» the exercise of this office. The Southern delegates protesting against this action, the difficulty was settled only by dividing the churches and property into the Northern and Southern jurisdiction. Bishop Andrew adhered to the South, retiring from active work in 1868.

ANDREW, John Albion, American statesman, the «War Governor» of Massachusetts: b. Windham, Me., 31 May 1818; d. Boston, 30 Oct. 1867. He was graduated from Bowdoin College in 1837, and practised law in Boston 1840–61. He was an earnest anti-slavery advocate and defended the fugitive slaves Shadrach, Burns, and Sims. Elected to the State legislature in 1858, was a delegate to the Chicago Convention in 1860, and being nominated governor was elected by an immense majority. He forecast the war, announced in his message the intention to put the State militia on a war footing and privately invited co-operation from other governors. On Lincoln's first call for troops, 15 April 1861, he sent them so promptly that on 19 April the 6th Massachusetts shed the first blood of the war in passing through Baltimore, and within a week he had dispatched to the front five regiments of infantry, a battalion of riflemen and a battery of artillery. In 1862 he urged the national abolition of slavery and the enrolment of colored troops, and in 1863 sent out the first colored regiment, 154th Massachusetts; yet he repeatedly interfered to prevent harrying Southern sympathizers by arbitrary arrests, and after the war was foremost in urging conciliation and abstinence from vindictive or humiliating measures. He was re-elected regularly till 1866, when he refused further honors from pecuniary grounds and impaired health, continuing his law practice till death. He was a man of great personal charm and oratorical force, intensely sympathetic and humane, and of simple and frank nature. In religion he was a moderate Unitarian, believing in Christ's supernatural character, and was president of the first Unitarian National Convention in 1865.

ANDREW, Saint, one of the 12 Apostles, and the brother of Peter. There are four important references to him in the gospels, John i, 40, the only account of his introduction to Jesus, in which as a disciple of John the Baptist he follows Jesus on John's word and brings his brother Peter to him; John vi, 8, where he calls attention to the boy with the barley loaves, when the miracle of the loaves and fishes occurs; John xii, 22, where Philip, asked by the Greeks if they may see Jesus, consults Andrew before laying the request before Jesus; and Mark xiii, 3, where he is one of the four who privately asked Jesus the meaning of his utterance about the ruin of the temple. The other two synoptics do not allude to him. John i, 44 says he was from Bethsaida in Galilee. Tradition early gave him a conspicuous place among the Twelve, and very important «acts of the Apostle Andrew» were in circulation as early as the middle of the 2d century, but have survived only in later recasting. There were also acts of Matthew and Andrew, and of Peter and Andrew, and a «Martyrdom of Andrew.» A gospel of Andrew is mentioned later, but not otherwise known. A tradition of unknown date and no value accredits him with preaching in north Greece and Epirus and in Scythia, and being martyred on a cross shaped like an X at about 70 A.D.

ANDREW I, a king of Hungary, 1046–1061; compelled his subjects to embrace Christianity, exiled his brother Béla and died in battle.

ANDREW II, king of Hungary, 1205–1235, who fought in the crusades, and displayed great valor; granted the Golden Voull, styled the Hungarian Magna Charta.

ANDREW III, king of Hungary, 1290–1301. He was opposed in his claims to the throne, and involved in a civil war during his reign; he died in 1301.

ANDREW, Saint, Cross of, is a white saltire on a blue ground, to represent the X-shaped cross on which the patron saint of Scotland suffered martyrdom, from an early date adopted as the national banner of Scotland. It is combined with the crosses of Saint George and Saint Patrick in the Union Jack. The Scottish Order of the Thistle is sometimes known as the Order of Saint Andrew.

ANDREW, Saint, The Russian Order of, the most important of Russian orders, founded by Peter the Great in 1698. It has but one class and is confined to members of the imperial family, princes and persons of the rank of general who already hold two other important orders. The badge of the order displays on the obverse the double-headed eagle, crowned, on which is a Saint Andrew's cross

enameled in blue, with a figure of the saint and bearing in the four corners the letters S. A. P. R. (*Sanctus Andreas Patronus Russiæ*).

ANDREW OF CRETE, or **JERUSALEM,** was so named because he was bishop of the Island of Crete. He was born at Damascus about 660 and early became a monk at Jerusalem; hence his later name. He was a member of the Sixth General Council of Constantinople, 680, where he was ordained deacon. He was made archbishop of Crete by Philippus Bardesanes. He was a member of the Pseudo-Synod of Constantinople in 712, which restored the Monothelite heresy. Before he died he renounced his error. He was the author of several hymns, a considerable number of which are included in the Greek Service Books. John Mason Neale has translated several. He died at Mitylene about 714.

ANDREWES, Lancelot, English bishop: b. near Barking, Essex, 1555; d. London, 25 Sept. 1626. Having taken orders he was appointed to the parsonage of Alton, afterward to the vicarage of Saint Giles, Cripplegate, and in 1589 was made a prebend and canon of Saint Paul's, and master of Pembroke Hall. Queen Elizabeth, esteeming him highly, appointed him one of her chaplains in ordinary, besides bestowing other preferment upon him; and he was in no less favor with James I. In 1605 he became bishop of Chichester, in 1609 was translated to Ely and appointed one of the King's privy councilors and in 1618 was translated to Winchester. He was one of the greatest preachers of his time, and was one of those engaged in preparing the authorized version of the Scriptures. He left sermons, lectures and other writings, a manual of private devotions compiled by him in Greek and Latin being well known through several English translations.

ANDREWS, Charles Bartlett, American jurist: b. Sunderland, Mass., 4 Nov. 1834; d. Litchfield, Conn., 12 Sept. 1902. He was graduated from Amherst College; member Connecticut senate 1868–9; of the house 1878; governor of Connecticut 1879–81; judge of the Supreme Court 1882–89, and chief justice 1889–1901. He presided over the Connecticut Constitutional Convention of 1902.

ANDREWS, Charles McLean, American historian: b. Wethersfield, Conn., 22 Feb. 1863. Professor of history Bryn Mawr College, 1884–1907; Johns Hopkins University, 1907–10; Farnam professor of American history, Yale University (graduate school), 1910. Author: 'River Towns of Connecticut' (1889); 'The Old English Manor' (1892); 'Historical Development of Northern Europe' (1896); 'Contemporary Europe, Asia and Africa' (1871–1901); 'Colonial Self-Government' ('American Nation' Series V, 1904); two textbooks of English history and a number of papers and monographs on historical subjects. His chief work has been the preparation of a 'Guide to American History in British Archives' (2 vols., 1908, with Miss Davenport), and three reports in Reports of the American Historical Association, containing list of documents in the Public Record office. His lectures in colonial history, delivered at the University of Wisconsin and the University of Helsingfors, Finland, in 1911, were published as the 'Colonial Period of American History' (1912); he has prepared a 'Bibliography of History' (with Mr. Gambrill and Miss Tall), and edited a volume of the 'Original Narratives of American History' series, entitled 'Narratives of the Insurrections, 1676–1691' (1915).

ANDREWS, Christopher Columbus, American diplomat and writer: b. Hillsboro, N. H., 27 Oct. 1829; was brevetted major-general in the Civil War; United States Minister to Sweden from 1869 to 1877, and Consul-General to Brazil from 1882–85. Among his many works are 'Minnesota and Dakota' (1857); 'Practical Treatise on the Revenue Laws of the United States.' (1858); 'History of the Campaign of Mobile' (1867), and 'Brazil, Its Condition and Prospects' (1887, 3d ed., 1895). He served as forestry commissioner of Minnesota (1895–1911) and 16 of his forestry annual reports have been published.

ANDREWS, Edward Gayer, American clergyman: b. New Hartford, N. Y., 7 Aug. 1825; d. Brooklyn, N. Y., 31 Dec. 1907. He was graduated from Wesleyan University 1847; entered the Methodist ministry 1848; was principal of Cazenovia Seminary 1854–64; pastor in Stamford, Conn., and Brooklyn, N. Y. 1864–72; elected bishop 24 May 1872. He visited missions in Europe and India 1876–77; Mexico 1881; Japan and China 1889–90; and was delegate to English and Irish Methodist Churches 1894. He delivered the address at the state funeral of President McKinley in Washington, 17 Sept. 1901.

ANDREWS, Elisha Benjamin, American educator: b. Hinsdale, N. H., 10 Jan. 1844; d. 30 Oct. 1917. He served in Connecticut regiments through the Civil War and rose to the rank of second lieutenant. He was graduated from Brown University in 1870, and Newton Theological Institution in 1874. He was prominent both as teacher and pastor 1874–82 and as professor of history and political economy at Brown University 1882–88. In the year last named he was elected president of Brown University and under his administration that institution greatly increased its efficiency. In 1898 he resigned the presidency on account of criticism of his views on the silver question, but complied with the request of his trustees to withdraw his resignation. He was elected superintendent of schools in Chicago 1898, and in July 1900, chancellor of the University of Nebraska, and became chancellor emeritus 1 Jan. 1909. During the years 1909–10 he made a tour of the world. Besides many published addresses he has written 'Institutes of General History' (1887); 'Institutes of Economics' (1892); 'An Honest Dollar' (1894); 'Wealth and Moral Law' (1894); 'History of the Last Quarter Century in the United States' (1896); 'Cosmology' (1900); 'History of the United States in Our Own Times' (1904); 'The Call of the Land' (1913).

ANDREWS, Ethan Allen, American biologist: b. New York city, 10 Sept. 1859. He was graduated from Yale, then took a post-graduate course in the Johns Hopkins University. He was appointed assistant professor of biology at the Johns Hopkins University in 1887, became associate professor in 1892 and

professor of zoology in 1908. In 1904 he was elected president of the Society of American Zoologists.

ANDREWS, George Pierce, American jurist: b. North Bridgeton, Me., 29 Sept. 1835; d. New York, 24 May 1902. He was educated at Yale, studied law and was admitted to the bar in 1861. He was United States district attorney for six years, assistant and corporation counsel, New York, 1872–84, and associate justice of the New York Supreme Court, 1884–1901. He was esteemed a high authority on municipal and corporation law and his opinions in tax cases were especially valued. A very notable event in his career was his conviction of Capt. Nathaniel Gordon in 1860 for slave trading. Gordon was captured with a crew of nearly 900 negroes, was twice tried for piracy and finally convicted as a result of the convincing argument of Andrews. It is generally conceded that the conviction and execution of Gordon ended the slave trade in the United States. It had existed for more than 300 years, and for 42 years after Congress had made it piracy, punishable with death. Thousands of negroes had suffered tortures on the long voyages between African and American ports, and thousands more had died and been cast overboard, but not a person engaged in the nefarious traffic had been punished in this country until Mr. Andrews obtained the conviction and execution of Gordon. Prior to that event 130 vessels had been engaged in the slave trade, and New York was their headquarters. See UNITED STATES — SLAVERY IN THE.

ANDREWS, Lorrin, American missionary: b. East Windsor, Conn., 29 April 1795; d. Honolulu, 29 Sept. 1868. He was educated at Jefferson College and Princeton Theological Seminary; missionary in the Hawaiian Islands 1827, until in 1840, from anti-slavery scruples, he resigned connection with the American board. He became a judge and secretary of the privy council, 1845–55; translated a part of the Bible into Hawaiian and compiled the following works: 'Vocabulary of Words in Hawaiian' (1836); 'Grammar of the Hawaiian Language' (1854); 'Dictionary of the Hawaiian Language' (1865); all published in the island.

ANDREWS, Saint, University of. See SAINT ANDREWS.

ANDREWS, Samuel James, American clergyman: b. Danbury, Conn., 31 July 1817; d. 11 Oct. 1906. He was graduated at Williams College 1839, he was admitted to the bar in Connecticut and Ohio and practised law in those States 1842–44. He then studied at Lane Theological Seminary; ordained in Congregational ministry, 1846; pastor, East Windsor, Conn., 1848–55; adopted the Irvingite doctrines and was in charge of a Catholic and Apostolic Church congregation in Hartford, Conn., from 1868. Author of 'Life of Our Lord upon Earth' (1862); 'God's Revelations of Himself to Men' (1885); 'Christianity and Anti-Christianity in Their Final Conflict' (1898); 'William Watson Andrews: A Religious Biography' (1900); 'Man and the Incarnation' (1905).

ANDREWS, Stephen Pearl, American author: b. Templeton, Mass., 22 March 1812; d. New York city, 21 May 1886. He was educated at Amherst; practised law in New Orleans and Texas. His enthusiastic advocacy of the abolition of slavery took him to England in 1843 to raise money to pay for the slaves and make Texas free. He learned in England phonography and became the founder in this country of the present system of phonographic reporting, editing journals devoted to it and publishing numerous instruction books. Early in life he announced the discovery of the unity of law in the universe, and devoted the last half of his life to developing this philosophy, called by him "Integralism," and to the construction of a universal language which he named "Alwato," as a part of this system of "universology." He spoke several languages and is said to have had a knowledge of 30. In 1882 he instituted the "Colloquium," a series of conferences for the exchange of opinions between leading New York clergymen and others of the widest diversity of religious, philosophical and political views. His chief works are 'Discoveries in Chinese' (1854); 'Synopsis of Universology and Alwato' (1871); 'Basic Outline of Universology' (1872); 'Grammar of Alwato' (1877); 'Transactions of the Colloquium' (Vols. I, II, 1882–83); 'The Church and Religion of the Future' (1886).

ANDREWS, Thomas, Irish chemist and physicist: b. Belfast, 19 Dec. 1813; d. there, 26 Nov. 1885. He studied at Belfast and at Glasgow, and later at Trinity College, Dublin. Finally he was graduated as M.D. at Edinburgh in 1835 and settled down to a successful medical practice in his native place, also giving instruction in chemistry at the Academical Institution. In 1845 he was appointed vice-president of the newly established Queen's College, Belfast, and professor of chemistry, and these two offices he held till 1879, when failing health compelled his retirement. Andrews first became known as a scientific investigator by his work on the heat developed in chemical actions, for which the Royal Society awarded him a medal in 1844. Another important research was devoted to ozone. But the work on which his reputation mainly rests, and which best displayed his skill and resourcefulness in experiment, was concerned with the liquefaction of gases. He carried out a very complete inquiry into the laws expressing the relations of pressure, temperature and volume in carbonic dioxide, in particular establishing the conceptions of critical temperature and critical pressure and showing that the gas passes from the gaseous to the liquid state without any breach of continuity.

ANDREWS, William Draper, American inventor: b. Grafton, Mass., 1818; d. 1896. In 1844 he invented the centrifugal pump which made it possible to save goods not injured by water from abandoned wrecks; the pump was manufactured in England as the Gwynne pump; was patented in the United States in 1846. Later he invented and patented the anti-friction centrifugal pump; made various modifications of centrifugal pumps and patented a widely-used system of gangs of tube-wells.

ANDREYEV, ăn-drā'yĕf, **Aleksandr Nikolaevich,** Russian dramatist: b. Government of Pskovskaya, 18 Feb. 1830. After being graduated from an engineering school Andreyev served at first in the Ministry of Ways and

Communications and later in the Imperial Palace, the Ministry of Finance and the Ministry of the Interior. In 1877 he resigned from the governmental service, being at that time a state councillor. He was elected honorary member of the Academy of Fine Arts and in 1860 Emperor Alexander II presented him with a brilliant ring. His dramas (about 20) were well received in St. Petersburg, though many of them have never been published. Some of his best dramas were published by Wolf in 1875 under the title, "A. N. Andreyev's Theatre." He has been even more productive in fiction and his short stories and novels, 'Scenes on a Steamboat,' 'Humoristic Scenes,' 'The Governess,' 'The Patroness,' etc., have gained him great fame. His lyric poetry has been set to music and his important work, 'The Painting Art and the Painters of the Principal European Schools,' caused the Academy of Fine Arts to bestow on him the prize.

ANDREYEV, ăn-drā'yĕf, **Leonid Nikolaevich,** Russian writer: b. Orel 1871. After studying law at the universities of Moscow and St. Petersburg he found himself temperamentally unsuited for the task of making a living, which so depressed him that he attempted suicide when only 23 years of age. He finally found a position as police court reporter for a Moscow paper. This led to his attempting to write short stories, which were published in the daily papers. It was some of these that attracted the attention of Maxim Gorky to him, and this was the beginning of his success. From then until the present time he has been a prolific writer of short stories, essays and dramas. By many he is considered the leading writer of Russia and a brilliant genius. The first collection of his stories was issued in 1901 and a quarter million copies were sold within a short time. His stories have since been published in all European languages. Those that are available in English are 'The Red Laugh' (1905); 'The Seven Who Were Hanged' (1909); 'Judas Iscariot and the Others' (1910); 'A Dilemma' (1910); 'Anathema' (1910); 'Silence and other Stories' (1910). Besides these many others have appeared in American and English magazines as follows: 'The Burglar,' in *Current Literature* (May 1905); 'His Excellency the Governor,' in *Harper's Weekly* (9 Feb. to 2 March 1907); 'To the Stars' in *Poet Lore* (Winter 1907); 'Lazarus,' in *Current Literature* (May 1907); 'The Life of Man,' in *Oxford and Cambridge Review* (Midsummer 1908); 'Life is so Beautiful to the Resurrected,' in *Current Literature* (September 1910); 'Love of One's Neighbor,' in *The Glebe* (January 1914). Like most of the Russian short story writers there is an abnormal, morbid taint in Andreyev's stories that does not appeal to the American mind. The critics have experienced difficulty in classifying him. He has abandoned the traditional methods so apparent in his earlier work and his eccentricities have increased with the years. His philosophy is that of fatalism; most of his heroes landing in the grave or the madhouse. Andreyev is not a realist, however, but rather a mystic with keen analytic power who writes with great originality and brilliancy, yet creates no new types nor delineated real characters. See ANATHEMA (ANDREYEV'S).

ANDRIA, ăn'drē'ą, Italy, a town and episcopal see in the province of Bari, 35 miles west of the town of Bari. It was founded about 1046 by Peter, the first Norman Count of Andria. There are several fine churches of the 13th century. It is connected with Bari by steam tramway. Pop. about 49,000.

ANDRIEUX, ăn'drĭ-ē', **François Guillaume Jean Stanislas,** French man of letters: b. Strassburg, 6 May 1759; d. Paris, 9 May 1833. He was educated at Strassburg and studied law in Paris. He practised at the bar, but his attention was divided between his profession and literature. His plays are of the 18th century style, comedies of intrigue, but they rank among the best of the period next to those of Beaumarchais. 'Les Étourdis,' his best comedy, was presented in 1788 and won for the author the praise of La Harpe. He hailed the beginning of the Revolution with delight and received a place under the new government. He was later expelled and on his retirement he again turned to write for the stage, producing 'Le Trésor' and 'Molière avec ses amis' in 1804. He became professor of grammar and literature at the École Polytechnique and eventually at the Collège de France. As a professor he was extraordinarily successful. He was rigidly classical in his tastes, and an ardent opponent of romanticism. Among his other plays are 'La Comédienne' (1816) one of his best comedies, and a tragedy, 'Lucius Junius Brutus' (1830). Andrieux was the author of some excellent stories and fables, 'La Promenade de Fénelon'; 'La Bulle d'Alexandre VI' and the 'Meunier de Saint-Souci.' In 1829 he became perpetual secretary to the Academy.

ANDROCONIA, ăn'drǫ-cō'nĭ-ą, certain highly modified scent-scales shaped like battledores, on the wings of certain butterflies and caddis flies (*Trichoptera*). In certain butterflies (*Thecla, Danais,* etc.) they occur on the upper side of the fore wings in limited areas, such as in the discal spots, or they may be scattered in rows or irregularly over the upper surface, or in the folds of the wings. Fritz Müller has shown that these minutes scales function as scent-scales, and are confined to the males. Thomas has proved by sections of the wings of *Danais,* etc., that the androconia arise from glands situated in a fold of the wing, and that the material elaborated by the local glands, and distributed upon the surface of the wing by the androconia is that which gives to many of the *Lepidoptera* their characteristic odor. Scudder, who named them, says that they are very capricious in their occurrence. A number of allied genera may possess them, while a single genus, as closely allied, may be quite destitute. They occur in the *Nymphalidæ, Pieridæ, Lycæmidæ, Papilionidæ* and *Hesperidæ.*

ANDROMACHE, ăn-drŏm'ą-kē, in Greek legend, the daughter of Eëtion, Prince of Thebes in Mysia, and wife of Hector. She is one of the finest characters in Homer, distinguished by her affection for her husband and child, her misfortunes and the resignation with which she endures them. The death of her son Astyanax and the farewell scene between Andromache and Hector (Iliad, VI 323), were represented in ancient works of art, while Andromache her-

self is the subject of tragedies by Euripides and Racine.

ANDROMACHUS, ăn-drŏm'ăk-ŭs, a physician to the Emperor Nero and the inventor of a celebrated compound medicine called *theriake,* described in Galen's works.

ANDRONICUS I, ăn'dro-nī-cŭs (COMNENUS), Byzantine emperor: b. 1110; d. 12 Sept. 1185. In his youth he served against the Turks, in 1141 was for some time a prisoner and was afterward appointed to a military command in Cilicia, but was unsuccessful. Engaging in a treasonable correspondence with the King of Hungary, he was thrown into prison by his cousin, the Emperor Manuel; but after 12 years he succeeded in making his escape and reached Kiev, the residence of Prince Jaroslav. He regained the favor of his cousin by persuading Jaroslav to join him in the invasion of Hungary, and by his gallantry in that war; but again incurred his displeasure and was sent in honorable banishment to Cilicia. After a pilgrimage to Jerusalem and his scandalous seduction of Theodora, the widow of Baldwin, King of Jerusalem, he settled among the Turks in Asia Minor with a band of outlaws, making frequent inroads into the province of Trebizond; but at length made his peace with the Emperor and was sent to Œnoe in Pontus. Upon the death of Manuel in 1182 he was recalled to become, first, guardian, then colleague, of the young Emperor Alexius II. Soon after he caused the Empress-mother to be strangled, and afterward Alexius himself, whose youthful widow he married. His reign, though short, was vigorous, and restored prosperity to the provinces; but tyranny and murder were its characteristics in the capital. At last a destined victim, Isaac Angelus, one of his relatives, having fled to the church of Saint Sophia for sanctuary, a crowd gathered, and a sudden insurrection placed Isaac on the throne, while Andronicus, now 75 years of age, was put to death by the infuriated populace after horrible mutilations and tortures.

ANDRONICUS OF CYRRHUS, Greek astronomer: flourished about 100 B.C. He built a "horologium" at Athens, the so-called "tower of the winds," a considerable portion of which still exists. It is octagonal, with figures carved on each side, representing the eight principal winds. A brazen Triton on the summit, with a rod in his hand turned round by the wind, pointed to the quarter from which it blew. From this model is derived the custom of placing weathercocks on steeples.

ANDRONICUS OF RHODES, a Roman philosopher who interpreted the works of Aristotle (q.v.). He lived in Cicero's time. None of his known works are extant.

ANDROPOGON, ăn'drọ-pō'gŏn, a genus of about 200 species of grasses of very diverse utility, distributed widely, especially over dry plains throughout the temperate and tropical zones. The species are usually characterized by long, narrow leaves; terminal and axillary spikes; sessile perfect spikelets paired with pedicelled staminate, empty ones or scales; and straight or twisted awns. *A. halepensis,* or *Sorghum halepense* of some authors, Johnson grass, attains a height of from three to six feet from stout, perennial creeping rootstocks, which being difficult to eradicate make the plant a troublesome weed where not needed for pasture or hay, for which it is largely grown in South America, Australia and the southern United States, where it was introduced about 1830. It makes quick growth, yields abundantly and may be cut several times in a season. It is not fully hardy in the North, where, as in Europe, it is often grown for ornament. *A. schœnanthus,* lemon grass, and *A. nardus,* citronella grass, are handsome tropical species cultivated in India and Ceylon for the fragrant oils they contain, and which are used in perfumery, soap-making and in the former case for the adulteration of certain perfumes, notably attar of roses. *A. sorghum,* or *Sorghum vulgare* of some authors, is of wide economic importance, its numerous varieties or sub-species being cultivated for fodder, sugar, alcohol, brushes, brooms and its seeds, which last are used for poultry, stock, and human food (see SORGHUM). *A. provincialis, A. scoparius* and various other species known as blue-stem grass, are valued as fodder grasses in arid regions where they are native.

ANDROS, SIR Edmund, an American colonial governor; b. in London, England, 6 Dec. 1637; d. there, 27 Feb. 1714. His father was master of ceremonies to Charles I. His son earned the favor of the Stuarts by steady and laborious service, unwavering loyalty and military and executive ability. In 1666 he was made major of an infantry regiment and sent to America, where he won laurels against the Dutch. In 1672, after his return to England, he became titular commander of the British forces in Barbados, and in the same year was made major in a regiment of dragoons raised for Prince Rupert; also a "landgrave" in Carolina, two years later succeeding his father as bailiff of Guernsey.

In 1674 Andros was made "lieutenant and governor" of "all the Duke of York's territories in America," including New York (just restored by the Dutch, who had retaken it the year before), New Jersey and Delaware, Martha's Vineyard and parts of Maine, and a claim to all Connecticut west of that river. He arrived in November, and the next year began to push the Connecticut claim; but the Duke did not desire an appeal to force, and after making formal declarations at Saybrook, Andros retired. During the next two years the Indian troubles were acute; and in settling these he proved himself one of the ablest and most useful of Indian managers, winning the good will of the Iroquois at a critical time, and not only keeping his own colony protected, but sending help to the outlying points in Rhode Island, Massachusetts and Maine. He spent a few months in England in 1677–78, and was knighted. In 1678–80 there was increasing friction, religious and otherwise. He was an Episcopalian, and one of his appointees to a coadjutorship in an Albany church was tried for heresy but acquitted; Andros, however, tactfully quieted the disturbance and contributed to build a Reformed church in New York. Then the merchants charged him with unfairness in trade matters, and with suppressing part of his receipts in his public accounts, with the object of inducing the Duke to sell to some of them the right to farm the New York revenues. At this period Philip Carteret was acting as gov-

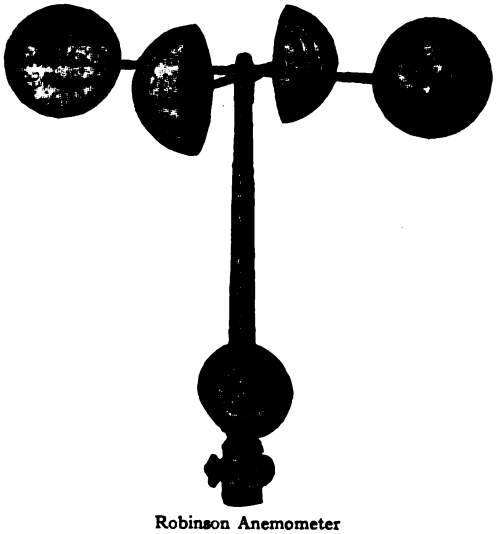
ernor of East Jersey under the Duke of York's grant to his brother and Berkeley; there were complications inherited from previous changes which forced Andros to keep interfering, under his superior commission, and at last he sent a body of soldiers to seize Carteret and bring him to New York to be tried for exercising illegal jurisdiction. Andros acted as judge, but the jury acquitted Carteret, who was triumphantly reinstated. Lady Carteret complained to the Duke of York, who recalled Andros, and sent out a commissioner to investigate this and the other charges: he reported that Andros was not in fault, but the latter was retained at home, made gentleman of the privy chamber to Charles II, and received a 99-years' grant of the island of Alderney and other favors.

The accession of the Duke of York as James II (February 1685) was followed by the return of Andros to New England, as the agent in an unpopular scheme of consolidation, and in consequence his memory has been loaded with unjustifiable abuse. The Massachusetts charter had been revoked in October 1684, and Charles II had appointed the notorious Col. Piercy Kirke governor; but as he never entered on his duties, Andros was commissioned governor of all New England as one centralized colony on 3 June 1686. Dislike to James has done injustice to this statesmanlike scheme, distasteful though it was to the New Englanders. The intention was to create, out of the several weak and mutually contending colonies, one strong confederated colony with a militia powerful enough to resist French and Indian aggression, and under one command. Andros can only be blamed for needless harshness or blundering or corruption in obeying his instructions; and despite the current opinion there was none of this, but rather the reverse. On arriving at Boston, 19 Dec. 1686, he organized his new government, which, as the people had no longer the right to tax themselves, levied a new tax, the exact counterpart of the old. Ipswich refused to pay, and the ringleaders were fined and imprisoned, as must happen under any law. Andros was ordered to proclaim all land titles invalid unless confirmed by the Crown for a quitrent. Outrageous as this may seem, it was held to be sound law, and he enforced it in the most humane way by bringing test suits against a few of the wealthiest citizens before proceeding further. As a fact, only a part had yielded when the Revolution interrupted it. He granted waste common-lands to individuals who would improve them; a venial crime. Heavy fees were charged by the public officials; but he neither fixed the rates, received the proceeds nor appointed the officers who did. He had Episcopal services held in the Old South Church, but only when its regular congregation was not using it; this sacrilege, however, has blackened his memory worse than anything else. He was sometimes sharp in speech; but when some wickedly foolish people charged him with secretly fomenting an Indian war, he only laughed at them and left the courts to attend to the matter. In a word, there was neither a political nor a religious reign of terror set up; no one was persecuted for non-conformity or executed or whipped for political offenses. Andros behaved like a statesman, an honest man and a humane one. He early extended his authority over Plymouth, New Hampshire and Rhode Island, as well as Maine and Massachusetts. In October 1687 he visited Hartford, to take up the Connecticut charter: the story of its being hidden in the Charter Oak is classic, and it is certain enough that one copy was hidden and was efficient in restoring the charter rights of the colony later; but there was another copy, and the event was regarded as of no significance at the time. Andros, on returning to Boston in 1688, received the news that he was made governor also of all the British provinces in America except Pennsylvania, Delaware, Maryland and Virginia. While making a tour of his northern provinces he was checked by the information that the Penobscot Indians, stirred up by Castine (q.v.), whose property had been taken, were about to go on the war-path. He collected 700 troops, and in November proceeded to Maine and garrisoned several posts. On 4 April 1689 news was received of the deposition of James II; on the 18th the citizens of Boston rose and captured Andros, and kept him prisoner till 2 August, when he escaped to New York, but was recaptured and brought back, and not released till February 1690. He returned to England to face a trial, with a committee of his accusers, but the charges fell through. William III needed officials as able and upright as he, and in 1692 made him governor of Virginia. He carried with him the charter of William and Mary College, and till 1698 remained in Virginia, a most public-spirited, hard-working, excellent ruler, doing much for the progress of the colony and esteemed by its people. His removal was caused by a quarrel with the commissary of the bishop of London and president of the college, who quarreled with all the governor. He was governor of Jersey 1704–06. He had been governor of every mainland English province in North America, and won the confidence of four successive monarchs of hostile lines. Even for New England, his departure was not an unmixed good, for it was followed by one of her bloodiest and most disastrous Indian wars, which his presence might have averted. See Brodhead, 'Governorship of Sir Edmund Andros' (1867); 'Andros in New England' (1691); Andros Tracts, with Notes and a Memoir' (Prince Society, Boston 1868–74).

ANEMOMETER, an-e-mom'e-ter, an instrument for measuring the velocity of moving air or other gaseous substance. It is almost always combined with a recording device and thus becomes strictly speaking an anemograph, though it is popularly known by the former name. The instruments in use as anemometers are of five distinct types: (1) The pendulum or Brooke anemometer; (2) the cup or Robinson anemometer; (3) the "windmill" anemometer; (4) the U-tube or Dines anemometer; and (5) the electrical anemometer.

The first consists essentially of a flat plate of definite area, usually one square foot, arranged so as to swing after the manner of a pendulum, by the pressure of the wind upon it. It is used chiefly in the determination of wind pressure upon buildings, bridges and other structures, although this pressure is translated into velocity by a suitable scale. The Robinson anemometer is described at length below. The "windmill" type is simply a minia-

ture windmill very lightly built, with small "sails" at the end of comparatively long arms, and held in a position to face the wind by a vane. This instrument is much more accurate in registering sudden gusts and lulls than the cup anemometer, but has the disadvantage of having to shift its position with a change of



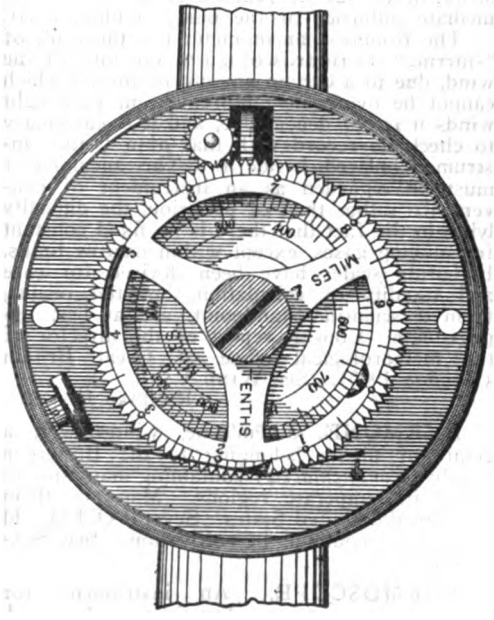
Robinson Anemometer

direction in the wind, and this occupies an appreciable length of time in which the record is incorrect. The U-tube anemometer is regarded as the most accurate one in common use. Its basic feature is a U-shaped tube containing a mobile liquid in the bend of the U. One of the top ends of the tube is bent so that the opening faces the draught whose velocity is to be measured; the other end is turned so that at the same time the passing draught exerts a sucking effect upon it. Under the influence of these two forces the liquid moves in the tube on which a scale is fastened. In a modification of this instrument called the Seger anemometer, two non-miscible liquids are used, generally paraffin oil and tinted alcohol. The Fletcher anemometer is also of this type, for use under trying conditions, like measuring the velocity of draughts in industrial chimneys. The liquid used in the Fletcher anemometer is ether. The instrument is at some distance from the chimney, and the arms of the U-tube are greatly extended. The electrical anemometer, also known as the Linear Hot-Wire anemometer, depends for its action upon the cooling by the passing draught of a hot platinum wire. The wire is heated to a dull red phase by its resistance to an electric current passing through it. As the draught cools the wire its resistance is increased, thus disturbing the electrical balance in a Wheatstone bridge. The additional current necessary to restore this balance measures the velocity of the current blowing upon the platinum wire. This instrument is extremely sensitive to low velocities, and may be used for velocities between two feet per second and 35 feet per second.

In commercial use anemometers are employed in measuring the velocities of gas or steam flowing through pipes; the delivery of hot air in heating schoolrooms and other public apartments, and also of cool air in ventilating them; the regulation of the flow of gases in some industries — as in the manufacture of sulphuric acid from pyrites; and in by far the larger numbers in determining and recording the velocity and direction of winds in meteorological and climatological observations.

The Robinson cup anemometer is used by the United States Weather Bureau. In this apparatus the hollow cups are made of thin aluminum or copper and are as nearly hemispherical as possible. These are securely fastened to small square steel arms set with their diagonals horizontal and vertical, respectively, so as to offer the greatest resistance to the bending action of the wind pressure upon the cups and as little resistance as possible to the wind itself. Copper cups should always be used for exposures where the aluminum does not well withstand the corrosive action of salt air or the acid fumes from smokestacks, etc. In the American standard instrument the cups are four inches in diameter and the arms 6.72 inches long from the axis to the centre of the cups.

The most prejudicial resistance in any part of the anemometer, when in good condition, is that occurring in the top bearing of the spindle. This bearing should first be made very smooth and polished and afterward kept clean and freely lubricated, if good results are to be expected. When well made and properly cared for the anemometer will show only a very little wear after years of exposure, even



Anemometer Dial

with comparatively high winds. The small bright spot upon the lower end of the steel spindle, where it wears against the steel plate, should never be larger than a pin head. If this portion becomes dry of oil by neglect, as sometimes happens, it will quickly wear flat and introduce a very great amount of friction. The

instrument can then be restored to good condition only by recutting and polishing the pivot end, also the small plate, so as to conform to the above specifications.

Certain advantages result from the use of ball-bearings in anemometers, chiefly in increasing the service to be obtained and in reducing the attention necessary to maintain the bearings in proper lubrication. The reduction in friction is not such an important gain as might be supposed, unless the instrument is used in very slight wind. The slight friction in any good anemometer is quite inconsequential in light and fresh winds, such as usually prevail at practically every station.

The ideal anemometer exposure is secured when the instrument is placed where the movement of the wind is unobstructed from any direction, such for example, as would be obtained in the centre of a large open expanse or plain. Only an approximation to the ideal exposure is possible in most places, but every effort should be made to better anemometer exposures in order that the records from the several stations may be comparable. Usually, with an anemometer exposed in a city or town, the great interference offered by buildings and other natural obstructions to the free movement of the wind causes the velocity to be much less in the vicinity of these obstructions than beyond such influence; therefore, in selecting the location for an anemometer preference should be given to the more elevated points in the vicinity of the station, and some rigid support should be used to raise the instrument as far as practicable above the immediate influence of the office building itself.

The Robinson anemometer has the fault of "slurring" its records of gusts and lulls of the wind, due to a certain amount of inertia which cannot be overcome. Moreover, in very light winds it is not dependable, and it is customary to check its record with that of a U-tube instrument placed beside it. The anemometer must be regarded as an instrument of convenience rather than of precision, the difficulty lying in the fact that there is no fixed constant for moving gases, except within narrow limits. Elaborate scales have been devised for ease and rapidity of calculation, but the results, from a scientific standpoint, are at best approximate. Consult report of the director of the meteorological office of Great Britain (London 1906). See WIND VANE.

RICHARD FERRIS.

ANEMONE, ă-nĕm'o-nę, wind-flower, a genus of plants belonging to the Buttercup family (*Ranunculaceæ*) containing many species found in temperate regions. Many of them occur in the United States. Several Old World species are common in cultivation. See SEA-ANEMONE.

ANEMOSCOPE. An instrument for showing the course or direction of the wind. It may be combined with the anemometer, thus indicating both the direction and the force of the wind. Latterly the anemoscope has been made self-recording, and now in most observatories needs no watching, every movement of the wind being written down, the force or pressure and the velocity in miles per hour being also recorded. This is done by pencils which press lightly upon a cylinder covered with a sheet of paper divided into horizontal hour-lines, the lines moving at the rate of half an inch an hour, a complete revolution of the cylinder occupying 24 hours. Lines marked by the pencils show by their relation to the graduated lines the direction of the wind at any moment of the day.

ANERIO, Felice, Italian composer: b. Rome 1560; d. Rome, 28 Sept. 1614. At the age of 15 he entered the choir at Saint Peter's as a soprano and became a pupil of G. M. Nanini. On the death of Palestrina (q.v.) in 1594, Anerio was appointed his successor as composer to the Papal Chapel, whilst Ruggiero Giovanelli was made conductor. Together with Fr. Suriano, Anerio edited the so-called Editio Medicæa of the Graduale of 1614. For many years several compositions of Anerio have been attributed to the great Palestrina himself, e.g., "Adoramus te Christe" and a "Stabat Mater." A great number of his hymns, masses and madrigals are still preserved in his own handwriting.

ANERIO, Giovanni Francesco, Italian composer, probably a brother of the preceding: b. and d. Rome about 1567–1620, respectively. He was a choir boy under Palestrina, and in 1609 received an appointment at the court of King Sigismund III of Poland. In the following year he became conductor in the cathedral of Verona; in 1611, prefect of the Jesuit College in Rome, and was ordained priest in 1616. He composed a great number of church pieces.

ANEROID BAROMETER, a species of barometer in which no fluid is employed, an ingenious and delicate instrument invented by M. Vidi of France in 1844. Its mechanism consists of a hollow metal cylinder, with thin and corrugated ends, which contract or expand according to the pressure of the atmosphere, the air within having been previously exhausted by the air-pump. The motion of the ends of the cylinder acts upon a principal lever attached to it, and connected with two smaller levers, to one of which a chain is attached, working upon a roller, and to the axis of the roller a hand is fixed, exhibiting the variations of the atmosphere by means of an index on the face of the barometer. A pocket aneroid is very useful for measuring small heights. See BAROMETER.

ANEURISM, a circumscribed tumor of an artery composed of a sac, the cavity of which communicates with the artery and contains liquid or coagulated blood. So-called "true" aneurisms are everywhere composed of all of the coats of the artery, and are rare and always small. Aneurisms are usually of the class anatomically designated as "false," in which only one of the coats of the artery takes part in the formation of the walls of the sac. Condensed adjoining tissues may also enter into the formation of the wall. A more common classification divides aneurisms into (1) common or encysted aneurisms, (2) arteriovenous aneurisms, (3) circoid aneurisms and (4) dissecting aneurisms. The first division includes aneurismal dilatation or fusiform dilatation which extends for some distance, with the three arterial coats preserved; true aneurism, mentioned above, limited to one point; false aneurism in which one coat has disappeared; and consecutive or diffused aneurism in which the condensed

adjoining tissues take part. Arteriovenous aneurism denotes an abnormal communication between artery and vein with or without an intermediate sac. Circoid aneurism means the general dilatation of an artery and its branches and dissecting aneurism is formed by the effusion of blood between the coats of an artery. Internal aneurisms are those situated within the thoracic or abdominal cavities, external aneurisms those in other parts of the body.

Aneurisms are also known as spontaneous or traumatic according to their origin. The latter occurs in consequence of sudden division or injury of the walls of an artery through some external agent or a splinter from a fractured bone. A spontaneous aneurism is due to a degenerative change in the wall of the artery by which its elasticity and resistance to strain are diminished. The degenerative change may be due to a lodgment of an embolus, overstretching, pressure of a ligature or some other mechanical cause. Anatomical factors in the production of an aneurism are those changes in the artery, change of direction, enlargement, bifurcation, attendant upon its course through the body. Occupations of exertion, alcoholic excess, the gouty or rheumatic diathesis, syphilis, are also causative factors. An aneurism may terminate spontaneously by coagulation of the blood within it. Absolute rest and low diet are the most essential medical means of treatment, but the treatment is largely surgical, its details depending upon the variety and situation of the aneurismal swelling.

ANGEL-FISH. See MONK-FISH.

ANGEL OF THE BATTLEFIELD. See ANTHONY, SISTER.

ANGELICA, a genus of herbs of the family *Apiaceæ*, consisting of 60 species, occurring in north temperate regions and in New Zealand, several species being natives of North America. The name angelica, however, is popularly applied to various other members of the same family. *Archangelica officinalis*, to which the name is most often given, is a tall herb with much divided leaves and small white flowers in umbels, native of Europe. The leaf-stalks were formerly blanched and eaten like celery. Candied in sugar they are much used in Europe as a sweetmeat.

ANGELICO, Fra, ŏn-jā′ lē-co, Florentine painter: b. Vicchio, in the province of Mugello, 1387; d. Rome 1455. Il Beato Fra Giovanni Angelico da Fiesole is the name given to this celebrated painter-friar. In English it runs — the Beatified Friar John the Angelic of Fiesole. His real name was Guido, but on becoming a brother in the Dominican Order at Fiesole he took the name of Giovanni, the name of Angelico by which he is always called in art circles being a surname that came to him later because of the quality of his work. We find him referred to as Angelico already in 15th century. The history of his early years is extremely obscure. We know that he became a Dominican in 1407 and that he shared the vicissitudes of his brethren of the convent, wandering to various cities, notably Cortona, where there are a number of his works. His training as an artist was probably before 1407 and it seems likely to have been in the school of Masolino, and that he began as a miniaturist. Another artist, of the previous generation, who influenced him is Orcagna. It is probable that Fra Angelico returned with the Dominicans to Fiesole in 1418 when they resumed their former residence. He remained there for 18 years. Under the protection of Cosimo de Medici, the brotherhood was installed in the monastery of San Marco in Florence in 1436. The decoration of this edifice, including several large frescoes and a large number of small ones in the individual cells, is one of the principal monuments of the Beato Angelico's long and unusually prolific career. We find here the great 'Crucifixion,' possibly unfinished, and certainly restored, which is one of the friar's most impressive works. Here also is the 'Annunciation' which is generally regarded as his most beautiful version of a subject to which he loved to return. No single institution more fully embodies the spirit of mediæval piety at the dawn of the Renaissance. Pope Eugenius IV, who had presided at the installation of the convent, was so impressed with Fra Angelico's achievement that he first offered him the archbishopric of Florence, and on his declining it, invited him to Rome to execute frescoes in the Vatican. Vasari is authority for the story, but his statement lacks authentication though credible enough in view of the humility of Fra Angelico. Fra Angelico was in Rome most of the time from 1445 until his death. In 1447 he worked for some time in the Duomo of Orvieto. He was moreover busy on easel pictures for numerous cities, now scattered to Florence (the very important 'Descent from the Cross,' the 'Last Judgment' and the 'Coronation of the Virgin'), Paris, London, Munich, New York, etc., but the great work of his old age was the decoration of the chapel of Nicholas V, that pontiff having succeeded Eugenius while the work was in progress. The frescoes portray eight scenes from the lives of Saint Stephen and Saint Lawrence. While we may note certain changes as we take Fra Angelico's works in chronological order, a remarkable uniformity of ideal pervades them throughout. The almost unearthly purity of the artist's spirit, its sweetness — which never falls into weakness — and the ecstatic faith in the divinity of his guidance, combine to sweep away all obstacles of a material nature and produce in us the conviction that his art is sublime. Its modest exterior conceals immense gifts and inexhaustible resources which renew themselves afresh throughout his life. Attempting neither the emotional nor the technical scope of Giotto, Masaccio or Michelangelo, he so concentrates his spirit on his own problems that his work attains a Christian perfection even as a Greek master reaches a perfection in his sphere. In some respects he was even an innovator, being one of the first to paint the Christ Child as a real infant, and the very first to paint a landscape that can be identified. According to all accounts which have reached us, few men have deserved more nobly the distinction of beatification than Fra Giovanni Angelico. He led a holy and self-denying life, shunning all advancement, and was a brother to the poor. He painted with unceasing diligence, and treated none but sacred subjects. Consult Langton Douglas, 'Fra Angelico,' (London 1900); other treatises are by Supino (Florence 1898; Eng. trans. 1902); Sortais (Lille 1905); Newnes (London 1906).

ANGELL, ān'gĕl, **George Thorndike,** American reformer: b. Southbridge, Mass., 1823; d. 16 March 1909. He was graduated at Dartmouth College in 1846, and admitted to the bar in 1851. He was active in promoting measures for the prevention of crime, cruelties and the adulteration of food. He founded the American Humane Educational Society.

ANGELL, James Burrill, American educator: b. Scituate, R. I., 7 Jan. 1829; d. Ann Arbor, Mich., 1 April 1916. He was graduated from Brown University in 1849; and was professor of modern languages and literature there, 1853–60; editor Providence *Journal,* 1860–66; first president of the University of Vermont, 1866–71; became president of the University of Michigan in 1871 and held that position until 1909 when he became president emeritus, after conferring degrees on 2,500 graduates, of whom 200 were women. He was fortunate in being able to secure the loyalty of all his students, a d it was said regarding him that the real capital of Michigan was at Ann Arbor. He served at United States Minister to China (1880–81); and as Minister to Turkey (1897–98). He was also one of three commissioners appointed to negotiate a new treaty with China, and was subsequently chairman of the Canadian Commission for Deep Waterways (1896). In November 1900 the Emperor of Japan conferred on him the first decoration of the Imperial Order of the Sacred Treasure in token of his regard for the eminent American diplomat. Beside numerous addresses and articles in periodicals he was the author of 'Manual of French Literature' (1857); 'Progress in International Law' (1875); 'Reminiscences' (1912); 'Selected Addresses' (1912).

ANGELL, Joseph Kinnicut, American legal writer: b. Providence, R. I., 30 April 1794; d. Boston, Mass., 1 May 1857. Graduated at Brown University, 1813. Edited the *Law Intelligencer and Review,* 1829–31, and prepared the first published law reports of Rhode Island. Alone or in collaboration he produced a number of valuable and much used legal textbooks, chief of which are, 'Treatise on Corporations' (4th ed., 1858), highly commended by Chancellor Kent; 'Common Law in Relation to Watercourses' (4th ed., 1850); 'Liabilities and Rights of Common Carriers' (2d ed., 1845); 'Law of Fire and Life Insurance.'

ANGELO, ān'jĕlō, **Michael.** See MICHELANGELO.

ANGELS. A creation of higher order than man mentioned in the Bible. They are often represented as the messengers of God and are frequently pictured as ministering to man. There are degrees among the angels for there are seven archangels, four of whom are mentioned in Scripture. All are mentioned in the book of Enoch. The idea of guardian angels was early adopted in the church. It was thought that each individual is under the care of his own particular angel. The Jews and Mohammedans hold the same belief.

ANGELUS, the Catholic prayer and practice by which the mystery of the Incarnation is recalled to mind and is honored, morning, noon and evening. It forms the subject of a famous painting by Millet (q.v.).

ANGERS, ān'zhā', Sir **Auguste Réal,** Canadian statesman: b. 4 Oct. 1838. He was called to the bar, and became a Q.C. in 1880, in which year he was elected to the Dominion House of Commons. He was a puisne judge of the Superior Court of Quebec, 1880, and lieutenant-governor of the province, 1887–92, in which position he dismissed the Mercier ministry on account of the Baie des Chaleurs Railway scandal. From 1892–95 he was Dominion Minister of Agriculture, and president of the council, 1896. He was knighted in 1913.

ANGERS, Felicité ("Laure Conan"), French-Canadian novelist: b. Malbaie, Que. She is the author of a number of works which have had a wide circulation, among them 'Angeline de Montbrun' (1884); 'Si les Canadiens le voulaient'; 'Élisabeth Seton' (1903).

ANGERS, France, city, capital of the department of Maine-et-Loire, 191 miles southwest of Paris. It occupies a rising ground on both banks of the Maine, which is here crossed by three bridges. Of its numerous mediæval buildings the most important is the Cathedral of Saint Maurice, dating from the 12th century. The palais de justice, the institute, a fine theatre and a hospital are the more remarkable of the modern buildings of the town. Its educational institutions include ecclesiastical seminaries, a lycée, a preparatory school of medicine and surgery, a university with free faculties of theology, law, letters and science, a higher school of agriculture, training colleges and a school of fine art. The prosperity of the city is largely due to the great slate quarries of the vicinity, but the distillation of liqueurs, cable, rope and thread-making, and the manufacture of boots and shoes, umbrellas and parasols are leading industries. Machine construction, wire-drawing and the manufacture of sparkling wines and preserved fruits are also carried on. The chief articles of commerce, besides slate and manufactured goods, are hemp, early vegetables, fruit, flowers and live-stock. In Roman times Angers was called Juliomagus. It suffered severely from the invasions of the Northmen in the 9th century; the Huguenots took it in 1585 and the Vendean royalists were repulsed near here in 1793. Till the Revolution, Angers was the seat of a celebrated university founded in the 14th century. Pop. 84,000.

ANGINA PECTORIS is a name given to a symptomatic condition characterized by attacks of pain often very severe associated with an oppressive, tightening sensation and sense of impending death. The pain may begin in remote organs or in the precordial region and from this point radiate usually to the left shoulder and arm even to the extremities of the fingers. Sometimes it attacks the right arm or both arms simultaneously.

There are two main varieties of angina pectoris, the so-called true and the false. True angina pectoris is rare, at least in this country. For this form there is an anatomical basis in the heart itself. It may be explained as a vascular cramp, the pains occurring in the vessels themselves and extending to the aorta. The condition is associated with sclerosis of the coronary arteries. The attacks may last

from fifteen minutes to an hour or two. Sometimes they prove directly fatal. Precipitating causes of attack are bodily exertion, marked mental excitement and errors in diet. The condition is probably due to coronary disease combined with disease of the heart muscle so that death is actually caused by failure of the latter to perform its function.

False angina pectoris is comparatively frequent and must be classed as a neuralgia of the heart. The pain simulates that of true angina pectoris but is less severe and never fatal. The two forms, however, may be combined and are at all times difficult to differentiate. The latter belongs probably to the class of cardiac neuroses largely of psychogenic origin.

ANGLE, strictly, the degree of inclination to one another of two lines which meet, or of two or more surfaces which meet. The same term is incorrectly used for the point in which lines meet, and for the line in which two surfaces meet, but such point or such line is the vertex of the angle. The lines in the first case and the surfaces in the second case are known as the sides of the angle.

An angle made by two lines is called a plane angle; that made by two planes, a dihedral angle; that made by three or more planes, a solid angle, or a polyhedral angle. Angles may again be subdivided into rectilinear, curvilinear and mixed angles. A plane rectilinear angle is the inclination to each other of two straight lines which meet but are not in the same straight line. A curvilinear angle is the inclination to each other of two curved lines which meet in a point, and is equal to the inclination of the tangents to the curves at their intersection. A mixed angle is one formed by the meeting of a curve and a straight line, and is measured as the angle between the straight line and the tangent to the curve at the point of intersection.

Plane rectilinear angles are generally divided into right and oblique, or into right, obtuse and acute. When a straight line standing upon another straight line makes the two adjacent angles (those on the right and left of it) equal to one another, each of them is called a right angle. An oblique angle is one which is not a right angle. An obtuse angle is that which is greater than one right angle, but less than two. An acute angle is that which is less than a right angle; both are oblique. A spherical angle is one formed by the intersection or the meeting of two great circles of a sphere.

The inclination of any two lines which form the sides of an angle is measured by the length of the arc they cut out on the circumference of a circle struck from the vertex of the angle as a centre. The radius of this circle is obviously a matter of convenience, as the arcs will be the same for any radius. Angles are expressed, therefore, in degrees, minutes and seconds and decimals of a second: as, for example, an angle of 90°, or an angle of 3° 14′ 17.298″. In mathematical nomenclature an angle upon a diagram is usually designated by three letters, one on each side and one at the vertex, the vertex letter being the middle one of the triad. as, the angle BCD, in which C is the letter at the vertex. In some cases where no ambiguity could arise, the same angle might be named by its vertex letter: as, the angle C. The complement of an angle is that length of arc by which it falls short of 90°: that is, the complement of an angle of 32° is 58°. The supplement of an angle is that length of arc by which it falls short of 180°: that is, the supplement of 75° is 105°.

In astronomy angles are considered between lines which never meet. These angles are measured as between parallels to the original lines, so drawn or projected that they do meet.

ANGLE IRON. See RAILS AND STRUCTURAL SHAPES.

ANGLE OF SITE. In indirect fire, when the gun and target are at different levels, it is necessary to set the gun at an elevation corresponding to the height of the target. The angular measurement of this difference, expressed in mils, is the *angle of site.* Practically speaking, it is such that when set off on the quadrant, the axis of the bore will point directly at the target. Having set off the angle of site, the gun is given the additional elevation corresponding to the range. If the target can be seen at the gun, the angle of site may be measured directly. To find the angle of site, it is necessary to determine the difference in level between the gun and the target in yards, and to convert the yards into mils. For convenience the vertical scales of all artillery instruments are graduated from 0 to 600, and the centre of the reading, 300, corresponds to horizontal.

ANGLE OF TRACTION. In draught, the angle which the plane of the traces makes with the road on which the carriage is moving. Artillery carriages having sometimes to move over the worst description of roads, the angle of traction must be slightly inclined upward, as the vertical component of the pull will then assist the wheels to surmount obstacles; the weight being transferred to the shoulders of the horse, increasing the pressure of his feet upon the ground, thus giving him a firmer hold and enabling him to exert with ease a stronger pull, while the resistance against which he contends is at the same time diminished.

ANGLER. See GOOSEFISH.

ANGLES, a German tribe who probably lived originally on the east side of the Elbe, between the Saale and Ohre rivers, whence they moved to what is now the district of Angeln in Schleswig-Holstein, lying between the territories of the Jutes and Saxons. They never approached the Rhine and the Roman frontiers, hence we do not find their name mentioned by the Roman authors, who comprehended them, with many others, under the general name of Chauci and Germani, till the conquest of Britain made them better known as a separate nation. In the 5th century they joined their powerful northern neighbors, the Saxons, and took part in the conquest of Britain, which from them derived its future name of England. A part remained in their continental homes and gave their name also to the district of Angeln.

ANGLESEY, ăn'gl'-sē, **Henry William Paget, Marquis of,** English soldier and statesman: b. 1768; d. 1854. He was educated at Oxford, and in 1790 entered Parliament as member for the Carnarvon boroughs. In 1794 he took part in the campaign in Flanders under

the Duke of York, and in 1808 was sent into Spain with two brigades of cavalry to join Sir John Moore, and in the retreat to Coruña commanded the rear guard. In 1812 he became, by his father's death, Earl of Uxbridge. On Napoleon's escape from Elba he was appointed commander of the British cavalry, and at the battle of Waterloo overthrew the Imperial Guard. For his services he was created Marquis of Anglesey. In 1828 he became lord-lieutenant of Ireland and made himself extremely popular, but was recalled in consequence of favoring Catholic emancipation. He was again lord-lieutenant in 1830; but lost his popularity by opposition to O'Connell and his instrumentality in the passing of the Irish coercion acts, and he quitted office in 1833.

ANGLESEY, ăn'gl'-sē, or **ANGLESEA,** an island and county of north Wales, in the Irish Sea, separated from the mainland by the Menai Strait. It is about 20 miles long and 17 miles broad, with an area of 175,836 acres, of which fully 150,000 acres are under rotation crops and permanent pasture, exclusive of mountain and heath land used for pasturage (about 7,600 acres). It is divided into three *cantrefs,* and each of these into two *cwmwds,* equivalent to the English hundreds. The surface of the island, with the exception of Holyhead, Parys and Bodafon Mountains, is comparatively flat, and the climate, though milder than that of the adjoining coast, is not so favorable to the growth of trees. There are no streams of any importance, but the coast affords some natural harbors, the principal of which are Holyhead and Beaumaris. The principal crops are oats, barley, turnips and potatoes. Cattle and sheep are the staple productions of the island, and large numbers of both are annually exported. Of minerals, Anglesey contains copper, lead and silver ore, limestone, marble, asbestos and marl, but the copper mines at Parys and Mona, once so celebrated and productive, have much decreased in value. The Menai Strait is crossed by a magnificent suspension-bridge, 580 feet between the piers and 100 feet above high-water mark, allowing the largest vessels which navigate the strait to sail under it; and also by the great Britannia Tubular Bridge, for the conveyance of railway trains, Holyhead being the point of departure for the Irish mails. The market towns are Holyhead, Beaumaris, Llangefni and Amlwch, the first-named by far the largest. The county itself returns a member to Parliament. On the coast are several small islands, the chief being Holyhead and Puffin Island.

ANGLESITE, ăn'glę-sīt (from the island of Anglesea, where it was first observed, a native sulphate of lead, $PbSO_4$. It crystallizes in the orthorhombic system and has a hardness of from 2.75 to 3, and a specific gravity varying from 6.1 to 6.4. It may be transparent or opaque, and in color white, greenish, yellowish or gray. It occurs in many localities, usually in connection with galena, whence it is apparently derived by oxidation. Beautiful transparent crystals of it, several inches in diameter, are known. Anglesite, in a massive form, is extensively mined as an ore of lead (q.v.)

ANGLEWORM. See EARTHWORM.

ANGLIA, East, an English kingdom founded by the Angles (q.v.) in the 6th century in the eastern part of England in what now forms the present counties of Norfolk and Suffolk. It was conquered by the Danes in 878, and became part of the English kingdom in 921, under Edward, son and successor of Alfred. The modern see of Norwich corresponds in extent to the East Anglian kingdom, and the name East Anglia is still frequently employed to denote these two shires.

ANGLICAN CHURCH. See CHURCH OF ENGLAND.

ANGLIN, Margaret Mary, American actress: b. Ottawa, Ont., 3 April 1876. Her father, the Hon. T. W. Anglin, was speaker of the Canadian House of Commons. She was educated at Loretto Abbey, Toronto, and at the Sacred Heart Convent, Montreal. In May 1911 she married Howard Hull of New York. In 1894 she was graduated from the Empire School of Dramatic Acting, New York, and made her first appearance in that city, in 'Shenandoah'; an injury sustained in riding laid her up for some months, but in 1896 she became leading lady with James O'Neill and toured with him in the United States and Canada, playing with much success in 'The Girl I Left Behind Me,' 'Dr. Jekyll and Mr. Hyde,' 'The Courier of Lyons,' 'Virginius,' 'Hamlet' and 'Monte Christo.' Subsequently she played with the Sothern Company and scored heavily as Lady Ursula; but it was not till 1898 that as Roxane, with the late Richard Mansfield, in 'Cyrano de Bergerac,' she gave evidence of her great future as an actress of sterling merit. As leading lady with Charles Frohman in California 1899, she gathered fresh laurels, which were afterward sustained, and added to, in the same capacity with the Empire Theatre Company, New York. Later she starred with Henry Miller, producing such plays as 'Mrs Dane's Defence,' 'Macbeth,' 'The Only Way,' 'Zira,' 'The Aftermath,' 'Young Fernald,' 'The Great Divide,' the latter causing a veritable sensation in the dramatic world. In 1909 she produced 'The Awakening of Helena Ritchie,' having made a successful tour of Australia in Shakespearean repertoire not long before, afterward she went to Egypt. In 1910 she produced Sophocles' 'Antigone' at the Greek Theatre, Berkeley, Cal., and 'Electra' in 1911, when she also toured Canada in the comedy, 'Green Stockings.' She produced Euripides' 'Iphigenia in Aulis' and 'Medea' at the Greek Theatre in California during the Panama Pacific Exposition of 1915. A Boston writer, speaking of her rendition of 'Zira,' said that in a generation there had only been Bernhardt's to match it, and Mme. Bernhardt has stated her to be "one of the few dramatic geniuses of the day."

ANGLING, the sport of fishing with hook and line. Some authorities have insisted that a rod is an essential concomitant. There is, however, on record of a court proceeding the decision that a rod is not necessary to the practice of angling, but that the personal manipulation of the tackle as *sport* creates the distinction between angling and ordinary commercial fishing.

By its devotees angling in its highest development is claimed to be both an art and a science, as well as the sport of sports — especially to "the Contemplative Man" as Izaak Walton styled him nearly three centuries ago.

The requirements of a peculiarly cultivated judgment and skill, and equanimity of temper, together with the fascination of the picturesque in nature's water courses and water levels, to be followed in solitude, stealthily and in silence, combine to give to angling a charm to which no other sport may lay equal claim.

The literature of angling has been prodigious, more than 3,000 volumes on the subject having been published since the first, "The Treatyse of Fyshynge with an Angle," appeared in 1496 — besides innumerable essays, papers and magazine articles.

Angling divides naturally into "sweet water" or fresh water angling, and salt water or sea angling.

The game fish most sought by fresh water anglers in America are, first of all, the Atlantic salmon and the brook trout, with the black bass a strong rival for the reputation of either as to the quality of piscatorial sport they afford. The favorite salmon haunts are the rivers of Canada, into which the salmon finds its way from the salt sea. The land-locked salmon and ouananiche, found in the lakes and streams of Maine and Canada, also belong in the first rank as sport fishes. The speckled trout and black bass are generally distributed all over the country, thanks to the activities of the United States Bureau of Fisheries, and there are few sections north of Georgia where they may not be found. In this organized distribution of game fishes the brown trout of Europe and the rainbow trout of the Pacific coast streams have shared with the commoner brook or speckled trout, and from year to year are to be found in increasing numbers and in an ever-widening area. Other sweet-water fish which attract the attention of discriminating sportsmen are the muscallunge, pike and pickerel, and the lake trout and salmon trout. By many anglers the world over the docile perch would be mentioned among sport fishes, and with good reason if the fact that it has contributed a myriad hours of gentle sport to multitudes of simple fishers be allowed to count in its favor.

Sea angling is sport of sterner and often strenuous quality. Its captures are large and powerful fish with whom angling becomes in some instances a battle rather than a sport. The variety of game fishes sought in salt waters is much larger than that which lures the fresh water angler. Bluefish, striped bass, weakfish and sea bass are well known to the shore and off-shore anglers of the north Atlantic and north Pacific coasts. The sporting grounds for big fish are the semi-tropical waters of Florida and the Gulf, and of southern California. Here the tarpon, tuna, yellowtail, shark, swordfish and the ray invite the absorbed attention of the most vigorous sportsman, and it must be said that the contest with a big fish on light tackle is not one for the delectation of the "Contemplative Man" for whom the immortal Izaak recorded his peaceful observations.

The culmination of the angler's art is, by common consent, the capture of fish with the artificial "fly." The special skill required in casting the fly accurately to the spot decided upon, whether it be near or far, and whatever the difficulties which nature presents, calls for devoted practice and persisting patience. A very few anglers seem to possess it naturally: for the great majority it must be acquired.

There are two schools of fly-casters among anglers, the old-fashioned wet caster, who did not restrict himself to any number of flies, and who moved up or down the stream casting frequently as he went, his fly sinking below the surface of the water, and the modern school of dry casters who restrict themselves to a single artificial fly, made very small, dressed with upstanding wings, so as to ensure its floating on the surface, and sometimes anointed with an odorless oil to keep it dry. The distinction is far from being a rigid one, most flycasters being quite ready to substitute a wet fly for a dry one when the fish refuse the latter. Some anglers of the ultra type do not indulge in promiscuous fishing but await the rise of a fish, and then devote their energies to the capture of that particular specimen.

In either school the casts are divided into six classes: the overhand, the underhand, the spray cast, the wind cast, the flip cast and the switch cast. The object of them all is to cause the fly to drop upon the water as if it were a natural fly which had alighted on the surface in its natural habit, or had fallen off some overhanging branch, or been blown from the grass and was floating down stream. The most commonly used cast is the overhand. To perform it the angler standing on the river's brim unwinds a few yards of his line and lets the fly float down stream, raising his rod until it is at an angle of some 60 to 80 degrees in front of him. With a swift movement of the wrist, he lifts it so that it passes over his shoulder: the line follows and passes away beyond it. At a moment only to be learned from experience, but which every angler soon feels, he throws the rod forward and onward in the direction in front of him which he wants the fly to take, and it falls there, gently. This cast is possible wherever there are neither trees nor rocks for the necessary distance behind the angler. When these are present the switch cast is used: in that the fly is drawn along the top of the water toward the angler's feet, and then, lowering his rod by a quick downward movement, the line is sent forward rolling over and over itself in curves. When all the curves are unwound the fly falls back into the water at the extreme end of the line. The first movements in the wind cast are the same as those of the switch cast: the difference is in the thrash by which the line is made to travel up against the wind. The flip cast is made by taking the fly between the thumb and finger, pulling the top of the rod down until it is a bow, and then letting it slip back. The force will carry the fly to the desired spot. The spray cast is used now when a great length of line is out. The fly is then drawn up to the feet of the angler and the pole thrown forward up stream, not, as in the overhead cast, swished behind the line of the shoulders.

For the experienced angler there is nothing to be said — he knows it all. But for him of little experience or none, it is advised that he read freely among the books written on the subject before essaying the adventure in the open. Careful study of the habits of the fish to be hunted will be well repaid in the weight of the creel on the homeward stretch; and fishermen's lore should be absorbed without stint. It is an old saying that "good tackle is half the battle." It is a common mistake to start in with

a very cheap and hence unresponsive outfit. It is unwise also to select the most refined and delicate tackle before appreciative skill is acquired. In the selection of tackle the personal equation is a large and weighty factor. The tackle which best *suits* the angler is that which will eventually bring him the most fish. But fishing tackle is a subject so diverse and extended as to demand a separate article, and to that the reader is referred for detailed information. See FISHING TACKLE.

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ANGLO-AMERICAN COMMISSION, a joint international commission appointed in 1898 by the United States and Great Britain for the negotiation of a plan for the settlement of all controversial matters between the United States and Canada. The subjects submitted for the consideration of the commission were officially determined as follows: "The Behring Sea sealing question, reciprocal mining regulations, the preservation of the fisheries of the Great Lakes, the north Atlantic fishery question, the boundary question, the alien labor laws, and reciprocity of trade." Lord Herschell, Sir Wilfred Laurier, Sir Richard Cartwright, Sir Louis H. Davies and Mr. J. Charlton, a member of the Dominion Congress, were appointed British commissioners. The American commissioners were United States Senators Fairbanks and Gray, Congressman Dingley, Reciprocity Commissioner Kasson and ex-Secretary of State Foster. The commission met at Quebec, 23 August, Lord Herschell being chosen chairman; W. C. Cartwright, of the Foreign Office, and H. Bourassa, member of Parliament for Labelle County, Quebec, were chosen British secretaries and C. P. Anderson United States secretary. Later in the year an adjourned session was held in Washington, D. C., which adjourned without practical results.

ANGLO-CATHOLIC, a term applied to those members of the Anglican communion whose beliefs and religious forms most nearly approach those of the Roman Catholic Church. Ritualists, as Anglo-Catholics are frequently called, lay especial emphasis on the "Catholic principles" of apostolic succession, regeneration in baptism, the Eucharistic real presence and the authority of tradition.

ANGLO-INDIANS, the name officially adopted in 1911 by the British government in India for those born in that country of mixed descent, in other words, a half-breed between a European and an Asiatic parent. These were formerly styled *Eurasians.*

ANGLO-ISRAELITE THEORY, a peculiar belief as to English origins. It assumes that the English are descended from the lost 10 tribes of Israel; but the theory is untenable on any scientific grounds, for the tribes vanished through absorption in neighboring peoples and were not lost in any real sense. Consult Streator, 'The Anglo-Alliance in Prophecy, or the Promises to the Fathers' (1900).

ANGLO-JAPANESE TREATIES. The first treaty between England and Japan was signed 30 Jan. 1902. The text is as follows:

The Governments of Great Britain and Japan, actuated solely by a desire to maintain the status quo and general peace in the extreme East, being moreover specially interested in maintaining the independence and territorial integrity of the Empire of China and the Empire of Korea, and in securing equal opportunities in those countries for the commerce and industry of all nations, hereby agree as follows:

Article 1. The High Contracting Parties, having mutually recognized the independence of China and Korea, declare themselves to be entirely uninfluenced by any aggressive tendencies in either country. Having in view, however, their special interests, of which those of Great Britain relate principally to China, while Japan, in addition to the interests which she possesses in China, is interested in a peculiar degree politically, as well as commercially and industrially, in Korea, the High Contracting Parties recognize that it will be admissible for either of them to take such measures as may be indispensable in order to safeguard those interests if threatened either by the aggressive action of any other Power, or by disturbances arising in China or Korea, and necessitating the intervention of either of the High Contracting Parties for the protection of the lives and property of its subjects.

Art. 2. If either Great Britain or Japan, in the defence of their respective interests as above described, should become involved in war with another Power, the other High Contracting Party will maintain a strict neutrality, and use its efforts to prevent other Powers from joining in hostilities against its ally.

Art. 3. If in the above event any other Power or Powers should join in hostilities against that ally, the other High Contracting Party will come to its assistance, and will conduct the war in common, and make peace in mutual agreement with it.

Art. 4. The High Contracting Parties agree that neither of them will, without consulting the other, enter into separate arrangements with another Power to the prejudice of the interests above described.

Art. 5. Whenever, in the opinion of Great Britain or Japan, the above-mentioned interests are in jeopardy, the two Governments will communicate with one another fully and frankly.

Art. 6. The present agreement shall come into effect immediately after the date of its signature, and remain in force for five years from that date. In case neither of the High Contracting Parties should have notified twelve months before the expiration of the said five years the intention of terminating it, it shall

remain binding until the expiration of one year from the day on which either of the High Contracting Parties shall have denounced it. But if, when the date fixed for its expiration arrives, either ally is actually engaged in war, the alliance shall, ipso facto, continue until peace is concluded.

The second treaty was signed at London 12 Aug. 1905. The following letter explains its objects and purposes.

Despatch to his Majesty's Ambassador at Saint Petersburg, forwarding a copy of the Agreement between the United Kingdom and Japan, signed at London, 12 Aug. 1905.

The MARQUIS OF LANSDOWNE to SIR C. HARDINGE

Foreign Office, Sept. 6, 1905.

SIR,—I inclose, for your Excellency's information, a copy of a new Agreement concluded between his Majesty's Government and that of Japan in substitution for that of Jan. 30, 1902. You will take an early opportunity of communicating the new Agreement to the Russian Government.

It was signed on Aug. 12, and you will explain that it would have been immediately made public but for the fact that negotiations had at that time already commenced between Russia and Japan, and that the publication of such a document whilst those negotiations were still in progress would obviously have been improper and inopportune.

The Russian Government will, I trust, recognize that the new Agreement is an international instrument, to which no exception can be taken by any of the Powers interested in the affairs of the Far East. You should call special attention to the objects mentioned in the preamble as those by which the policy of the contracting parties is inspired. His Majesty's Government believe that they may count upon the goodwill and support of all the Powers in endeavoring to maintain peace in Eastern Asia, and in seeking to uphold the integrity and independence of the Chinese Empire and the principle of equal opportunities for the commerce and industry of all nations in that country.

On the other hand, the special interests of the contracting parties are of a kind upon which they are fully entitled to insist, and the announcement that those interests must be safeguarded is one which can create no surprise and need give rise to no misgivings.

I call your especial attention to the wording of Article II, which lays down distinctly that it is only in the case of an unprovoked attack made on one of the contracting parties by another Power or Powers, and when that party is defending its territorial rights and special interests from aggressive action, that the other party is bound to come to its assistance.

Article III, dealing with the question of Korea, is deserving of especial attention. It recognizes in the clearest terms the paramount position which Japan at this moment occupies and must henceforth occupy in Korea, and her right to take any measures which she may find necessary for the protection of her political, military, and economic interests in that country. It is, however, expressly provided that such measures must not be contrary to the principle of equal opportunities for the commerce and industry of other nations. The new Treaty no doubt differs at this point conspicuously from that of 1902. It has, however, become evident that Korea, owing to its close proximity to the Japanese Empire and its inability to stand alone, must fall under the control and tutelage of Japan.

His Majesty's Government observe with satisfaction that this point was readily conceded by Russia in the Treaty of Peace recently concluded with Japan, and they have every reason to believe that similar views are held by other Powers with regard to the relations which should subsist between Japan and Korea.

His Majesty's Government venture to anticipate that the alliance thus concluded, designed as it is with objects which are purely peaceful and for the protection of rights and interests the validity of which cannot be contested, will be regarded with approval by the Government to which you are accredited. They are justified in believing that its conclusion may not have been without effect in facilitating the settlement by which the war has been so happily brought to an end, and they earnestly trust that it may, for many years to come, be instrumental in securing the peace of the world in those regions which come within its scope.—I am, &c.,

(Signed) LANSDOWNE.

The text is as follows:

Inclosure. Agreement between the United Kingdom and Japan, signed at London, Aug. 12, 1905.

Preamble. The Governments of Great Britain and Japan, being desirous of replacing the Agreement concluded between them on Jan. 30, 1902, by fresh stipulations, have agreed upon the following articles, which have for their object:—

(a) The consolidation and maintenance of the general peace in the regions of Eastern Asia and of India;

(b) The preservation of the common interests of all Powers in China by insuring the independence and integrity of the Chinese Empire and the principle of equal opportunities for the commerce and industry of all nations in China;

(c) The maintenance of the territorial rights of the High Contracting Parties in the regions of Eastern Asia and of India and the defence of their special interests in the said regions:

Article 1. It is agreed that whenever, in the opinion of either Great Britain or Japan, any of the rights and interests referred to in the preamble of this Agreement are in jeopardy, the two Governments will communicate with one another fully and frankly, and will consider in common the measures which should be taken to safeguard those menaced rights or interests.

Art. 2. If by reason of unprovoked attack or aggressive action, wherever arising, on the part of any other Power or Powers either contracting party should be involved in war in defence of its territorial rights or special interests mentioned in the preamble of this Agreement, the other contracting party will at once come to the assistance of its ally, and will conduct the war in common, and make peace in mutual agreement with it.

Art. 3. Japan possessing paramount political, military and economic interests in Korea, Great Britain recognizes the right of Japan to take such measures of guidance, control and protection in Korea as she may deem proper and necessary to safeguard and advance those interests, provided always that such measures are not contrary to the principle of equal opportunities for the commerce and industry of all nations.

Art. 4. Great Britain having a special interest in all that concerns the security of the Indian frontier, Japan recognizes her right to take such measures in the proximity of that frontier as she may find necessary for safeguarding her Indian possessions.

Art. 5. The High Contracting Parties agree that neither of them will, without consulting the other, enter into separate arrangements with another Power to the prejudice of the objects described in the preamble of this Agreement.

Art. 6. As regards the present war between Japan and Russia, Great Britain will continue to maintain strict neutrality unless some other Power or Powers should join in hostilities against Japan, in which case Great Britain will come to the assistance of Japan, and will conduct the war in common, and make peace in mutual agreement with Japan.

Art. 7. The conditions under which armed assistance shall be afforded by either Power to the other in the circumstances mentioned in the present Agreement, and the means by which such assistance is to be made available, will be arranged by the naval and military authorities of the contracting parties, who will from time to time consult one another fully and freely upon all questions of mutual interest.

Art. 8. The present Agreement shall, subject to the provisions of Article VI, come into effect immediately after the date of its signature, and remain in force for ten years from that date.

In case neither of the High Contracting Parties should have notified twelve months before the expiration of the said ten years the intention of terminating it, it shall remain binding until the expiration of one year from the day on which either of the High Contracting Parties shall have denounced it. But if, when the date fixed for its expiration arrives, either ally is actually engaged in war, the alliance shall, ipso facto, continue until peace is concluded.

In faith whereof, the undersigned, duly authorized by their respective Governments, have signed this Agreement, and have affixed thereto their seals.

Done in duplicate at London, the 12th day of August, 1905.

LANDSDOWNE,

His Britannic Majesty's Principal Secretary of State for Foreign Affairs.

TADASU HAYASHI,

Envoy Extraordinary and Minister Plenipotentiary of His Majesty the Emperor of Japan at the Court of St. James.

Thus it will be seen that whereas the first treaty referred to China and Korea exclusively, and only became operative upon the intervention of a third Power, the treaty which is superseded applies also "to the regions of eastern Asia and of India," and becomes operative when either party to the agreement becomes the object of wanton attack or aggression with respect to the special interests in the regions coming within the scope of the agreement. In effect this new treaty guarantees the status quo for very nearly the entire continent of Asia, of course omitting Turkey. England will have Japan's support to withstand any foreign aggression in Persia and Afghanistan or against India, while Japan has the offensive and defensive backing of England in the new relations which she occupies toward Asiatic countries. The terms of this treaty are eminently satisfactory to neutral nations in that they practically give the "open-door" to all and present vast permanent commercial opportunities. Many of the principles agreed upon and incorporated in the agreement were known before the Battle of the Sea of Japan.

ANGLOMANIA, a term denoting undiscriminating imitation of everything English on the part of persons of other nationalities. In the United States it was formerly applied to a fad of fashionable society.

ANGLO-SAXON, the name given by modern historians to the Angles, Jutes and Saxons who migrated to Britain from Germany in the 5th and 6th centuries A.D. They emigrated from the districts about the mouths of the Elbe and Weser, and the first body of them who gained a footing in England are said to have landed in 449, and to have been lead by Hengist and Horsa. The Jutes settled chiefly in Kent, the Saxons in the southern and middle country, and the Angles in the northern. Among the various Anglo-Saxon states that afterward arose those founded by the Angles first gained the preponderance, and gave to the whole country the name of *Engla-land,* that is, the land of the Angles.

Among the Anglo-Saxons we find the English constitution already existing in all its essentials, but its origin is not to be attributed to Alfred, though he brought it to a greater pitch of completeness. In a rudimentary form it was the common property of the Germanic peoples before the emigration of the Saxons and Angles from the Continent. It developed itself more independently, however, among the Anglo-Saxons than among those Teutonic races who came into closer connection with the Romans, and afterward with the Roman hierarchy. The Anglo-Saxon community was frequently spoken of as consisting of the *eorls* and the *ceorls,* or the nobles and common freemen. The former were the men of property and position, and were themselves divided into different ranks; the latter were the small landholders, handicraftsmen, etc., who generally placed themselves under the protection of some nobleman, who was hence termed their *hlaford* or lord. Besides these there was the class of the serfs or slaves (*theowas*), who might be either born slaves or freemen who had forfeited their liberty by their crimes, or whom poverty or the fortune of war had brought into this position. They served as agricultural laborers on their masters' estates, and though mere chattels, as absolutely the property of their master as his cattle, their lot does not appear to have been very uncomfortable. They were frequently manumitted by the will of their master at his death, and were also allowed to accumulate savings of their own, so as to be able to purchase their freedom or that of their children.

One of the peculiar features of Anglo-Saxon society was the *wergyld*, or life-price, established for the settling of feuds. "A sum, paid either in kind or in money where money existed, was placed upon the life of every freeman according to his rank in the state, his birth, or his office. A corresponding sum was settled for every wound that could be inflicted upon his person; for nearly every injury that could be done to his civil rights, his honor, or his domestic peace; and further fines were appointed according to the peculiar adventitious circumstances that might appear to aggravate or extenuate the offense. From the operation of this principle no one was exempt, and the king as well as the peasant was protected by a wergyld, payable to his kinsmen and his people" (Kemble, 'Saxons in England').

The king (*cyning, cyng*) was at the head of the state; he was the highest of the nobles and the chief magistrate. He was not looked upon as ruling by any divine right, but by the will of the people, represented by the *witan*, or Great Council of the nation. Accordingly we find that the new king was not always the direct and nearest heir of the late king, but one of the royal family whose abilities and character recommended him for the office. The king was invested with certain honors and privileges in order that he might maintain his position with becoming dignity. Besides his wergyld as an ætheling or person of royal blood, his life was further guarded by a sum of equal amount, called *cynebót*, or price of royalty, and the former sum was to be paid to his relations, the latter to the people. As king he held possession of the Crown lands, which were national property, distinct from any private estates he might himself purchase. Among other privileges he was entitled to a portion of the fines and confiscations laid upon offenders; he had the right of maintaining a standing army of household troops, the duty of calling together the Council of the Witan, and of laying before them measures which concerned the welfare of the state, with certain distinctions of dress, dwelling, etc., all his privileges being possessed and exercised by the advice and consent of the *witena-gemót*, or Parliament.

The queen also was held in high honor. She sat by the king in the assemblies, and she possessed a separate establishment from that of the king though on a smaller scale. Next in rank and dignity to the king were the *ealdormen*. These were at the head of the administration of justice in the shires, possessing both judicial and executive authority, and had as their officers the *scír-geréfan*, or sheriffs. One of their most important functions was the leading of the armed force of the county, a duty which often fell to their share during the period of the Danish invasions. The ealdorman, as such, held possession of certain lands attached to the office, and he was also entitled to a share of fines and other moneys levied for the king's use and passing through his hands. "Thus the position which his nobility, his power, and his wealth secured to the ealdorman was a brilliant one. In fact, the whole executive government may be considered as a great aristocratical association, of which the ealdormen were the members, and the king little more than the president. They were in nearly every respect his equals, and possessed the right of intermarriage with him; it was solely with their consent that he could be elected or appointed to the Crown, and by their support, co-operation, and alliance that he was maintained there. Without their concurrence and assent, their license and permission, he could not make, abrogate, or alter laws; they were the principal witan or counsellors, the leaders of the great gamót or national inquest, the guardians, upholders and regulators of that aristocratical power of which he was the ultimate representative and head" (Kemble, Vol. II, p. 142).

Under the Danish kings the ealdorman fell into a subordinate position, the eorl or earl taking his place in the county. The ealdorman and the king were both surrounded by a number of followers called *thegns* or thanes, bound by close ties to their superior. The king's thanes were the higher in rank, and formed a kind of nobility by themselves. They possessed a certain quantity of land smaller in amount than that of an ealdorman, and filled offices connected with the personal service of the king or with the administration of justice. According to Leppenberg they were in all respects the predecessors of the Norman barons. We frequently hear of a class of functionaries called *geréfan* or reeves, such as the *scír-geréfa* (shirereeve or sheriff), the *port-geréfa* (port reeve), the *tun-geréfa* (farm-reeve or bailiff; Scotch, *grieve*). These, of course, had different duties to perform, those of the shire-reeve being the most important. He presided at the county court along with the ealdorman and bishop, or alone in their absence; and had to carry out the decisions of the court, to levy fines, collect taxes, etc. In virtue of his office he had a portion of land allotted to him, hence called reeveland. The shires were divided into hundreds and tithings, the former being equal to 10 of the latter. The tithing consisted of 10 heads of families, jointly responsible to the state for the good conduct of any member of their body. For the trial and settlement of minor causes there was a hundred court held once a month. The place of the modern Parliament was held by the *witena-gemót*, the representative council of the nation. Its members, who were not elected, comprised the æthelings or princes of the blood royal, the bishops and abbots, the ealdormen, the thanes, the sheriffs, etc.

Agriculture, including especially the raising of cattle, sheep and swine, was the chief occupation of the Anglo-Saxons. Large tracts of the marshy land in the east of England were embanked and drained by them and brought into cultivation. Gardens and orchards are frequently mentioned, and vineyards were common in the southern counties. The forests were extensive, and valuable both from the mast they produced for the swine and from the beasts of the chase which they harbored. Hunting was a favorite recreation among the higher ranks, both lay and clerical. Fishing was largely carried on, herrings and salmon being the principal fish caught. The whale fishery was also pursued, when the Anglo-Saxon vessels used to go as far as Iceland. The manufactures were naturally of small moment. Iron was made to some extent, and some cloth, and salt works were numerous. In embroidery and working in gold, however, the English were famous over the continent, and very elegant specimens of gold work have come down to our times. There

was already a considerable trade at London, which was frequented by Normans, French, Flemings and the merchants of the Hanse towns. The Anglo-Saxon forefathers were notorious for their excessive fondness for eating and drinking, and in this respect formed a strong contrast to the Normans who invaded the country. Ale, mead and cider were the common beverages, wine being limited to the higher classes. Pork was a favorite article of food, and so were eels, which were kept and fattened in eel ponds and sometimes paid as rent. The houses were rude, ill-built structures, mostly of wood and without proper chimneys, but were often richly furnished and hung with fine tapestry. The dress of the Anglo-Saxons was loose and flowing, the materials being linen, woolen and also silk; and their garments were often adorned with embroidery. The men looked upon the hair as one of their chief ornaments, and wore it long and flowing over their shoulders, while they also usually wore beards.

Christianity was introduced among the Anglo-Saxons in the end of the 6th century by Saint Augustine, who was sent by Pope Gregory the Great and became the first archbishop of Canterbury. Kent, then under King Ethelred, was the first place where it took root, and thence it soon spread over the rest of the country. It must, of course, be remembered that the Britons and Scots had already embraced Christianity, and missionaries from these labored in the conversion of the Anglo-Saxons Monasteries were founded at an early period and became numerous. For a time the Anglo-Saxon Church maintained customs different in discipline from Rome, but uniformity was established in 670 by Theodore, the archbishop of Canterbury.

ANGLO-SAXON LANGUAGE AND LITERATURE. (*a*) Anglo-Saxon or Old English is the period of the English language extending from the end of the 5th to the end of the 11th century, the traditional story of the coming of Hengest and Horsa to England in 449, and the Norman Conquest in 1066 being convenient but arbitrary limiting dates. In its origins it is the language brought to Britain by the Teutonic conquerors of Roman and Celtic Britain in the 5th and 6th centuries. These Teutonic invaders were of three north German tribes, the Jutes, who settled mainly in Kent and on the Isle of Wight; the Angles, who settled the country north of the Thames; and the Saxons, who settled the regions south of the Thames except those occupied by the Jutes. The language of these three tribes was a branch of the West Germanic group of languages, its closest relationships being to Frisian and Low German. Following the lines of the tribal settlement in Britain, the language of the Anglo-Saxon period falls into three main dialects: (1) the Anglian, which subdivides into the Northumbrian, spoken north of the Humber, and the Mercian, spoken by the Angles occupying the Midland counties between the Thames and the Humber; (2) the West-Saxon, spoken by the Saxons who settled in the regions south of the Thames; (3) the Kentish, spoken by the Jutes in Kent and the Isle of Wight. In time the Kentish speech was assimilated by the West-Saxon. Kentish and West-Saxon combined, thus constituting a southern dialect, Mercian and Northumbrian a northern or Anglian dialect. As the dialect in which a literature was first produced and as the speech of originally the most powerful of the various kingdoms established by the invaders, the Angles gave the name to the speech of the country as a whole, *Englisc* or *Englisc sprœc*, and to the country itself, *Engla-land*, land of the Angles. The term Anglo-Saxon was rarely used in the Anglo-Saxon period and then only as the collective name of the people, not as the name of the language or of the country. At no time, however, in the Anglo-Saxon period was a single "standard" literary or colloquial speech established for all sections of the country, although an appearance of considerable uniformity is presented to us now by the fact that most of the extant monuments of the Anglo-Saxon period are preserved only in the West-Saxon dialect. This is due to the important unifying position which the West-Saxon royal house took under Egbert (802–39) and his successors Alfred (871–900) and Alfred's son Eadweard (900–24), Winchester, the capital of Wessex, thus becoming the literary as well as the political capital of the country. The literature of the earlier periods, chiefly poetic and written in the Anglian dialect, was at this time translated into West-Saxon, the West-Saxon versions replacing the more original ones, which were thus largely lost. Since the body of Anglo-Saxon literature is preserved only in the West-Saxon dialect, it is that dialect which is commonly understood by the term Anglo-Saxon and which is usually made the basis of systematic presentations of the grammar of the language.

Besides the natural changes in the vowel and consonant system to which language is always subject, Anglo-Saxon differs from later periods of English in two main respects. First, the inflectional system of Anglo-Saxon is relatively a full one. Nouns are inflected for four cases, nominative, genitive, dative and accusative, and for three grammatical genders, masculine, feminine and neuter. The definite article and the adjective are inflected in all the forms of the noun to agree with it. Adjectives are also inflected strong and weak, as they are in Modern German, according to their syntactical position. The verbal system, in its main outlines the same as that of Modern English, differs from the latter in the greater number of forms which it possesses, the subjunctive mood, for example, being still clearly distinguished both in form and use. Owing to its more complicated inflectional system in general, the rules of concord play a much more important part in Anglo-Saxon than they do in Modern English.

The second main distinguishing characteristic of Anglo-Saxon as compared with the English of the Middle and Modern English periods relates to its vocabulary. The Anglo-Saxon vocabulary is practically a uni-lingual one, whereas the tremendous transforming influence of French in the 13th and 14th centuries, and of the Renaissance in the 15th and 16th centuries, upon English, have changed the language of the later periods into a bi-lingual tongue. Aside from an insignificant Celtic element, the greater but still comparatively slight influence of Latin learning and Latin

Christianity on literary Anglo-Saxon, and toward the end of the Anglo-Saxon period, a small Scandinavian loan element, taken from the Danish and Norse conquerors of England, the vocabulary of Anglo-Saxon is an etymologically pure one. New ideas imported into the life of the people were usually expressed by means of native words giving the language, to the historical student, an appearance of homogeneity and simplicity possessed by no later period of English.

(*b*) Anglo-Saxon literature is rarely preserved in contemporary documents, the main reason being that, in a method of manuscript transmission, early monuments are gradually altered to fit the contemporary conditions and tastes of successive later generations, with the consequence that the originals are either lost or destroyed. Since most Anglo-Saxon literature is also anonymous, it becomes necessary to determine its date and authorship, so far as this can be done, by the internal evidence of the works themselves, aided by such slight outside help as may be afforded by occasional allusions in contemporary historical documents. Chronologically we may divide the literature of the whole period into three main groups: (1) the early or Anglian period, comprising chiefly poetical works composed in the latter half of the 7th and in the 8th century; (2) the Early West-Saxon period, comprising chiefly prose works written in the time of Alfred the Great; (3) the Late West-Saxon period, centring about the name of Ælfric, in the late 10th and the early 11th centuries, comprising mainly works in prose but also a few attempts at a revival of the earlier poetry. The body of this literature may be most conveniently reviewed under the two general heads of poetry and prose.

Anglo-Saxon poetry has been preserved to modern times in several different manuscripts of miscellaneous content, the most important being the 'Vercelli Book,' or 'Codex Vercellensis,' so called because the volume is now contained in the cathedral library at Vercelli in northern Italy; the 'Exeter Book,' or 'Codex Exoniensis,' still in the possession of Exeter Cathedral in England to the library of which it was pres nted about the year 1050 by Bishop Leofric; the 'Junian manuscript' (Junius XI), in the Bodleian Library at Oxford; and the 'Cotton Manuscript' (Cotton Vitellius A XV), in the British Museum, which contains the unique copy of the 'Beowulf.' These manuscripts were all written in the late 10th and early 11th centuries, although the period of the original composition of the works which they contain is of course much earlier. As to metrical form, however, the whole body of this poetry is remarkably homogeneous, and a single description will answer for all of it. The normal line of Anglo-Saxon verse consists of two halves, bound together by alliteration, alliteration consisting in the identity of initial consonants, or in the case of vocalic alliteration, the alliteration of any vowel with any other vowel. Each half line contains at least one alliterating syllable, although one may contain two and the other one, or both may contain two. Normally the number of alliterating syllables in a full line cannot be more than four and is usually less. Each half line contains two feet, the principle of the structure of the foot being accentual. Each half line contains at least two and no more heavily stressed syllables, the metrical stress coinciding with the logical stress of the words, and at least two unstressed syllables, although the number of the unstressed syllables may vary within fairly wide limits. According to the order of the stressed and unstressed syllables the half lines fall into a limited number of types, consecutive passages being made up of half lines of the various types arranged in whatever order the poet pleases. Within the limits of its own system the scansion of Anglo-Saxon poetry is rigid and exact. The use of stanzaic forms, except in one or two sporadic instances, was unknown to the Anglo-Saxon poets. Not only in metrical form, but also in its use of the various devices of poetical ornament, the body of Anglo-Saxon verse is fairly constant for all periods. The simile is very rarely used, its place being taken by the metaphor of "kenning." Specially characteristic of the poetic style is the device of "variation," by which an idea once expressed is repeated in several different forms by the use of synonymous terms. This gives to the poetry a retarding effect which is often particularly noticeable, and, to our modern taste, particularly inappropriate, in the narrative verse. The diction and tone of the poetry is elevated and dignified throughout, the poetic convention apparently not tolerating anything that approached "doggerel" in tone.

As to its content, Anglo-Saxon poetry is best considered in two groups, according as it follows the heroic or native tradition, or the Christian or literary tradition. Anglo-Saxon poetry of the native tradition goes back in its origins to the earliest historical periods of the race. The most primitive pieces are such poems as the 'Widsith,' 'The Complaint of Deor,' bits of popular lore such as the 'Charms' and 'Riddles,' and above all the 'Beowulf.' Although given a Christian coloring here and there by the interpolations of later transcribers and redactors, this poetry is essentially heathen, or, at least, non-Christian, in spirit. The 'Beowulf,' the most important single monument of the Anglo-Saxon period, is an heroic or epic poem of 3,182 full lines, telling the legendary and mythical deeds of a hero, Beowulf. Although in its present form the poem was probably composed in England in the 8th century, by an unknown author or compiler, from a group of more or less loosely connected lays which had grown up in popular oral tradition, its tone is that of a much earlier period. The action of the poem, which falls into two parts, is altogether legendary and mythical. It takes place not in England nor are any of the characters Anglo-Saxons. In the first part, Beowulf, a Geat from the Scandinavian peninsula, comes to the great hall Heorot, the royal residence of the Danish King Hrothgar, probably on the island of Zealand, to save it from the ravages of the moor-dwelling monster Grendel. He destroys Grendel and also Grendel's mother, both of whom may be interpreted in the terms of nature myth as symbolizing the destructive power of nature in certain phases, and then returns to his own country. In the second part, Beowulf who is now an old man and has for many years been King of the Geats, fights with a terrible firedrake that has been devastating his land; but

the hero himself is mortally wounded in the combat, and the poem closes with the account of his death and burial. Beside the main character Beowulf, and the mythological characters Grendel, Grendel's mother and the fire-drake, numerous minor characters are introduced and several longer episodes of great interest and beauty are developed. Despite the mythological character of the main action, the poem is given a strong human interest. The tone of the narrative throughout is epic and warlike and the action is always upon an extremely noble and dignified plane. The ideal of character presented in the hero Beowulf is one of valor and power directed by a self-sacrificing zeal for the welfare of others. Aside from the 'Beowulf,' native Anglo-Saxon epic poetry is limited to a fragment (48 lines) of what in its complete form was probably a poem on the same scale as 'Beowulf,' the fragment of the 'Battle at Finnsburh.' In the Late West-Saxon period a revival of interest in the earlier heroic poetry took place, the principal results being the 'Battle of Brunanburh,' descriptive of a battle between the Anglo-Saxons and the Danes in 937, and the spirited and technically admirable 'Battle of Maldon,' descriptive of a battle which took place in 991. With these poems expressive of the native or heroic spirit should be grouped a small number of shorter lyric pieces, also non-Christian in origin and feeling, 'The Wanderer,' 'The Husband's Message,' 'The Wife's Lament,' 'The Seafarer' and a group of some 90 poetical riddles. These poems are generally elegiac in tone and are often characterized by great imaginative beauty and charm of expression.

Anglo-Saxon poetry of the Christian tradition consists chiefly of the poetry of the Cædmonian and the Cynewulfian schools. It is Christian in subject-matter, but in method and style it resembles closely the native heroic poetry, a resemblance due to the conscious maintenance of the national and traditional poetic style. The only early authority for the existence of a poet Cædmon is Bede ('Historia Ecclesiastica,' Book IV, Chapter 24) who tells us that Cædmon was an illiterate lay-brother of the monastery at Whitby (then known as Streoneshalh), who received miraculously the gift of song and who versified certain stories from the Old and New Testaments. The date at which Cædmon lived, according to Bede, was several generations before himself, that is about 650. Answering in part to Bede's description, we have still extant long versified narratives based on the story of Genesis, of Exodus, of Daniel and of Judith. That all of these, however, are the work of a single poet, and that poet the one that Bede mentions, the internal evidence of the poems themselves forbids us to believe. It is probable that the only actual exact specimen of the work of Cædmon is a short poem of nine lines known as 'Cædmon's Hymn.' The other Cædmonic poems, although they have features in common, particularly as to style and subject-matter, which justify holding them together in a group, are undoubtedly the work of various authors.

Our information concerning a poet Cynewulf is derived altogether from certain poems to which the author has appended his signature in runic letters woven into the context of his verse. These signed poems are the 'Christ,' 'Juliana,' 'Elene' and the 'Fates of the Apostles.' The period at which Cynewulf lived and wrote was probably the last half of the 8th century, and the region in which he lived was probably Northumberland. Various attempts have been made to identify the poet with persons mentioned in contemporary historical annals, but although the name Cynewulf is of not infrequent occurrence, none of these attempts has so far proved convincing The remaining important poems of the Cynewulf group, some of which may have been composed by Cynewulf, although in no instance do the proofs permit a positive assertion, are 'Andreas,' based on the apocryphal legend of Saint Andrew; 'Guthlac,' in praise of the English saint of that name; the 'Dream of the Cross'; 'Phoenix,' a Christian allegorical poem; 'Harrowing of Hell' and a number of shorter hymnic poems. The characteristics which distinguish the Cynewulfian from the Cædmonic poems are sharply marked. The subject-matter of the latter is chiefly Old Testament story, of the former, New Testament story, as in 'Christ,' and Christian legend, as in 'Elene,' the story of the finding of the 'Cross' by Saint Helena, the story of Saint Juliana, of Saint Andrew and of Saint Guthlac. The Cædmonic poetry is characterized in general by severity and simplicity of style, whereas the Cynewulfian poetry is highly colored and romantic in tone. Particularly noticeable in the Cynewulfian poetry is the free and often extravagant use of phrases and themes borrowed from the 'Beowulf.' These differences in style, however, are relatively not great, and in a general review of Anglo-Saxon poetry one is struck by the remarkable similarity of treatment which characterizes it throughout. There is but one metrical form, sporadic instances of attempts at stanzaic structure, as in 'Deor,' merely serving to emphasize the fixed character of the metre.

Aside also from a few pieces written under the influence of the church hymns, the basis of all Anglo-Saxon poetical composition is narrative. Moreover the authority acquired by the poetry of the native heroic tradition succeeded in imposing an established and conventional standard of style which remained constant throughout the period. In its respect for rule and convention, in its uniform and "classic" quality, Anglo-Saxon poetry is paralleled by only one other period of English Literature, the Augustan age of the 18th century.

Anglo-Saxon prose owes its origins to two impulses, first, a national or patriotic, and second, a religious, educational or Latin impulse. The earliest prose (consult Sweet, 'Oldest English Texts,' 'Early English Text Society,' Vol. 83) dates from the end of the 7th and the beginning of the 8th centuries, and consists chiefly of glosses on Latin texts, of wills and similar legal documents. Anglo-Saxon laws were early written in the vernacular, being recorded apparently in much the same form which they had assumed in oral tradition; and it is probable that by the middle or end of the 8th century a custom of preserving records of events of national or local interest in English had grown up at various seats of learning throughout the country. If so, however, these records have not been preserved, owing probably to the fact that after their content had been incorporated into other and later docu-

ments, the originals were lost or destroyed. The chief extant prose monuments of patriotic or national interest are the codes of laws, which were got together and revised at various periods, and under the direction of various kings, one of the most notable forms being that known as the Legal Code of Alfred, and the Anglo-Saxon 'Chronicle' (consult 'English Chronicles'), in its final form written under the direction of Alfred the Great and perhaps in part actually by him, but to some degree also based on pre-existing Anglo-Saxon and Latin documents. The prose of educational and religious interest may be considered in two groups, that centring about the name of Alfred (849–901) or Early West-Saxon prose, and that centring about the name of Ælfric (955–1025?) or Late West-Saxon prose. Early West-Saxon prose consists almost altogether of translations of Latin works. Those which there is reason to believe issued directly from the pen of King Alfred are translations of Pope Gregory's 'Cura Pastoralis,' Bede's 'Historia Ecclesiastica Gentis Anglorum,' Orosius' 'Compendious History of the World' ('Pauli Orosii Historiarum Adversum Paganos, liber VII'), Boethius' 'De Consolatione Philosophiæ' and a combination from the writings of Gregory and Augustine known as the 'Blooms' (i.e., 'Anthology') of Alfred. A translation of the 'Dialogues' of Gregory was made, probably by Bishop Werferth of Worcester, for which Alfred wrote a preface. These works differ in the degree of fidelity with which they follow their originals, some, as for example the 'Cura Pastoralis,' being close but always idiomatic translations, whereas others, for example the versions of Orosius and Boethius, are fairly free and contain extensive original additions. The style of this prose of the Early West-Saxon period, of both the religious and the patriotic interest, is generally clear and simple, but is utterly without literary quality, its highest attainment being a certain naïve directness and vigor of expression.

The prose of the Late West-Saxon period consists in part of translations of Latin theological writings and of parts of the Bible, but owing to the renewed interest in preaching rising out of the Benedictine reform of the latter half of the 10th century, also of a considerable body of sermon literature reflective of contemporary conditions in England. The chief collections are the 'Blickling Homilies,' so called because the manuscript in which they are preserved is kept at Blickling Hall, Norfolk; the sermons of Wulfstan; and the 'Homilæ Catholicæ' or 'Catholic Homilies' of Ælfric. The 'Blickling Homilies' and the sermons of Wulfstan are popular in tone, frequently rising, especially in the sermons of Wulfstan, to passages of considerable oratorical power and effectiveness. Ælfric's homilies are more literary, both in themes and in style. They are written easily and lightly and represent the highest development of Anglo-Saxon in the direction of a literary artistic prose. Ælfric's taste, however, is not pure, and he frequently falls into the error of a too elaborate and conscious use of ornament and figure. Very characteristic of his method is a half-verse, half-prose style, which he made use of in his 'Saints' Lives.'

A fragment of a translation of the Greek romance of Apollonius of Tyre, made from a Latin version in the Late West-Saxon period by an unknown translator, should be mentioned as the sole example in Anglo-Saxon of the literature of the imagination in prose.

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GEORGE P. KRAPP,
Instructor in English, Columbia University.

ANGOLA, Ind., city and county-seat of Steuben County, 40 miles northeast of Fort Wayne, on the Lake Shore and Michigan Southern and the Saint Joseph Valley railroads. Tri-State College is located here. Angola was settled in 1834, incorporated as a town in 1866 and a city in 1906. Pop. 2,800.

ANGOLA (PORTUGUESE WEST AFRICA), west Africa, a Portuguese dependency on the Atlantic coast. It has a coast-line of over 1,000 miles, is bounded on the north and northeast by the Belgian Kongo, on the east by British South Africa and on the south by German Southwest Africa. It has an area of about 500,000 square miles and has belonged to the Portuguese since 1575, with the exception of the years 1641–48, when it was held by the Dutch. It is watered by the Coanza and other rivers and its climate, though excessively hot, is greatly tempered by the trade-winds. There are large tracts of amazing fertility in the interior. It is under a governor-general, who resides at Loanda. It is divided into six districts: Kongo, Loanda, Benguela, Mossámedes, Huilla and

Lunda. The capital is South Paolo de Loanda, other important towns being Cabinda, Ambriz, Novo Redondo, Benguela, Mossámedes and Port Alexander. The estimated population is about 4,000,000. There are 52 government schools, and seven municipal and two private schools, with altogether about 2,410 pupils. Various missions are at work in the country. The chief products are coffee, rubber, wax, sugar for rum distilleries, vegetable oils, cocoanuts, ivory, oxen and fish. Rubber supplies are now becoming exhausted; cotton-growing, formerly remunerative, has been neglected but is now increasing; tobacco is grown and manufactured for local consumption; petroleum and asphalt are worked by a British syndicate. The province contains large quantities of malachite and copper, iron, petroleum and salt. Gold has also been found. The imports in 1914 reached an aggregate value of $4,171,574 and the exports $3,477,789. The chief imports are textiles, chiefly cotton prints, hardware, machetes, tools, cutlery, musical instruments and drugs. The chief exports are coffee, rice and tropical fruits. Dried fish are exported in considerable quantities. The trade is largely with Portugal, the export trade exclusively. In 1914 there entered the port of Loanda 195 vessels of 293,531 tons and cleared 187 of 270,917 tons. The Portuguese National Navigation Company has most of the carrying trade to and from Europe; the steamers of three British lines and one German line touch at ports of the colony. There are 818 miles of railway in operation and 2,688 miles of telegraph line with 69 telegraph offices. Angola is connected by cable with east, west and south African telegraph systems.

ANGORA, or **ENGOUR**, Asiatic Turkey, (the ancient ANCYRA), a town 215 miles east of Constantinople, with which there is now railway communication. It is the capital of the vilayet of the same name. It has ruinous walls, and there are some remains of Byzantine architecture belonging to the ancient city, and a few relics of earlier times, both Greek and Roman. Among the latter are the remnants of the Monumentum Ancyranum, raised in honor of the Emperor Augustus, who much embellished the ancient city. Ancyra was the centre of the Tectosages, a Gallic tribe who settled in Galatia in the 3d century B.C., and was the capital of the Roman province of Galatia after 25 B.C. In the Byzantine period it was a place of great importance, was captured by Persians and Arabs; next fell under the sway of the Seljuk Turks, was held by the Crusaders for 18 years, and passed to the Ottoman Turks in 1360. A great battle between the Turks and Tatars was fought near Angora in 1402, in which the latter were victorious. It was reconquered by the Turks in 1415, and has since remained in their possession. It was taken by the Egyptians under Ibrahim Pasha in 1832. Angora is celebrated for the long-haired goats bred in its vicinity called by the Arabs the chamal goat, meaning "silky or soft." The fineness of the hair seems to depend on some peculiarity of the atmosphere, for it is remarked that the cats, dogs and other animals of the country have exceedingly long and fine hair, and that they all lose much of their distinctive characteristic when taken from their native haunts. Goat's hair forms an important export; other exports being goats' skins, mohair, grain, dye-stuffs, principally madder, and yellow berries; mastic, tragacanth and other gums; also honey and wax. Mohair cloth is manufactured. British manufactures are imported to some extent. Estimated pop. 35,000, of whom 18,000 are Moslems, 9,400 Roman Catholic Armenians and 400 Jews. Consult Wright, 'Cities of Paul' (Boston 1905).

ANGORA CAT. See CAT.

ANGORA GOAT. See GOAT.

ANGOSTURA. See CIUDAD BOLIVAR.

ANGOSTURA, or **ANGUSTURA**, ăn'-găs-tur'ä, **BARK**, the bark of a shrub or small tree of the Orinoco River Valley, *Galipea cuspara*, family *Rutaceæ*. It comes into the market in the form of broken quills, the outer surface being yellowish-gray and covered with small warty, corky growths. The taste is very bitter and aromatic. Its active constituents are volatile oil, hence its aromatic nature; angusturin, a bitter principle, and four alkaloids; cusparin, $C_{20}H_{19}NO_3$; galipein, $C_{20}H_{21}NO_3$; cusparedin, $C_{19}H_{17}NO_3$; and galipedin, $C_{19}H_{19}NO_2$. The action of these principles has not been thoroughly investigated. The bark is used as an antimalarial remedy and as an aromatic bitter for the stimulation of the intestines. It is also a laxative. It is a common ingredient of many potent medicines and liqueurs.

ANGOULÊME, ăn'goo-lam', France, city, capital of the department of Charente, and formerly of the province of Angoumois, on the left bank of the Charente, 60 miles north-northeast of Bordeaux. It stands on the summit of an isolated rocky hill, at the foot of which are the suburban quarters. There is a handsome modern town-house on the site of the old castle of the ancient counts of Angoulême. The cathedral is a Romanesque building, dating from the 12th century. Angoulême possesses a lyceum, theological seminary, normal school, two hospitals, a lunatic asylum, theatre, etc.; besides a public library and a museum of natural history. The staple manufacture is paper made in numerous mills in the neighboring valleys. There are also manufactures of carpets, linen, earthenware, woolen stuffs, fire-arms, gunpowder, wire, brandy, distilleries, etc. A considerable trade is carried on. Angoulême represents the ancient *Iculisma*, destroyed by the Normans in the 9th century. The bishopric was founded in 379. Clovis erected the first cathedral in 507. Pop. (1911) 38,211. Consult Babinet de Rencogne, 'L'Histoire du commerce et de l'industrie en Angoumois' (Angoulême 1879); Castaigne, 'La Cathédrale d'Angoulême' (ib. 1834); Nanglard, 'Fouille historique du diocèse d'Angoulême' (ib. 1897).

ANGSTROM, ăng'strĕm, **Anders Jons**, a Swedish scientist: b. 1814; d. 1874. From 1867 to his death the secretary to the Royal Society of Sciences at Upsala. He was a recognized authority upon optics, and among his writings are 'Optiska Undersökningar' (1853); his best known work, 'Recherches sur le Spectre Solaire' (1869); 'Sur les Spectres des Gas Simples' (1871); and 'Mémoire sur la Température de la Terre' (1871).

ANGUIDÆ, a family of vermiform, terrestrial lizards, including the glass-snake of

eastern Europe, the blindworm, slowworm and related forms, one of which (the genus *Gerrhonotus* of Central America and the western United States) has short, weakly developed limbs.

ANHIDROTICS, drugs which stop perspiration. The chief are atropine, agaricin, camphoric acid, picrotoxin, sulphuric acid, etc. They are used principally to check the excessive night-sweats of phthisis.

ANHYDRID, ăn-hī'drĭd (from a Greek word signifying "without water"), an oxide which produces an acid when it combines with water, or which is obtained by removing water from an acid. Oxides which yield salts by combining directly with other more basic oxides may also be classed as anhydrids. The oxides of most of the non-metallic elements are anhydrids.

ANHYDRITE, a mineral having the composition of calcium sulphate, $CaSO_4$ and differing from gypsum in its lack of water. In its common white, massive form it much resembles the snowy-white gypsum (q.v.), but is readily distinguished by its superior hardness, 3 to 3.5. Anhydrite also occurs in orthorhombic crystals and in cleavable-lamellar and fibrous masses. Its colors are very varied, white or gray being the most common, but blue and even brick-red not being uncommon. It is brittle, breaking with an uneven or splintery fracture, or when crystallized, cleaving with ease into rectangular chips. Its lustre is also very varied, the crystals appearing pearly, greasy or vitreous according to the faces examined.

ANHYDROUS AMMONIA. See GASES, COMPRESSED.

ANI, ä'ne, a bird of the subfamily *Crotophaginæ* of the cuckoo family, characterized by uniformly greenish-black or purplish-black plumage, a long, spreading tail and a high, keel-like projection on the top of the beak. Several species of these aberrant cuckoos inhabit South and Central America, one (*Crotophaga Ani*) occurring in Florida and the West Indies, where it is known as Savanna blackbird, black witch, and rain-bird. Bold but wary, the anis flit from bush to bush, uttering a mewing sound or a sharper double cry. Flocks gather in swampy woods, especially among mangrove thickets, and feed on insects, lizards, berries, etc., and accompany feeding cattle, picking ticks from their hides. These birds in most cases build huge community nests, many pairs nesting in niches in a great structure of sticks, etc., placed in some low tree; but this subject is not very well understood. An exception exists in one South American species, the "white ani" (*Guira piririgua*), which is brown, buff and white in color, and puts its pale blue eggs in individual nests.

ANILINE is an oily organic liquid classified as a base. Its formula is $C_6H_5NH_2$. It is commonly known as a derivative of coal-tar, but that substance contains only from ⅓ to ½ of 1 per cent of aniline, and the difficulties of separating it are so formidable that it is never derived from coal tar directly.

When pure, aniline is colorless, but commercial aniline turns gradually brownish on exposure to air and light, due to a small admixture of thiophene. Aniline solidifies at 18° F., and boils at 330°. Its vapor is inflammable, burning above the liquid with a large, smoky flame. Aniline is an actively corrosive poison. It has a peculiar nauseating odor, and its fumes exert decided, poisonous effects upon workmen handling it.

Aniline was first discovered by Unverdorben in 1826. He found it among the products of the destructive distillation of indigo. In 1834 it was identified by Runge in coal-tar. With the discovery of the first aniline color, "mauveine," by Perkin, in 1856, aniline became a valuable commercial product. It is now prepared from nitrobenzene with the aid of clean borings of soft cast iron in an acid solution. Into a still fitted with an agitator are placed a part of the nitrobenzene and a small quantity of the iron borings with water and hydrochloric acid. Steam is turned in and the contents are thus boiled and constantly stirred. The distillate is turned back into the still and the remainder of the nitrobenzene and iron borings are fed in at intervals. When the distillate ceases to contain nitrobenzene the operation is at an end, and the still will contain only aniline oil, water and iron chloride and oxide. A charge of 1,000 pounds of nitrobenzene requires about 1,000 pounds of iron borings and yields about 765 pounds of aniline oil in about 10 hours' operation. The final purification of the crude aniline oil is conducted in a vacuum still.

Commercially, three forms of aniline oil are recognized: (1) *Aniline oil for blue,* which is unmixed aniline; (2) *aniline oil for red,* which is a mixture of aniline with ortho-toluene and para-toluene, and (3) *aniline oil for safranine,* which is a mixture containing aniline and ortho-toluidine. See COAL-TAR COLORS.

With chlorates, in the presence of metallic salts, aniline gives the indispensable dyestuff *Aniline Black.* It is also extensively used as raw material for many other colors used in dyeing. In the manufacture of drugs aniline is used as the starting point for the production of acetanilide, antipyrine, antifebrin, etc. Nitrated aniline has been experimented with as an explosive. It is claimed to be peculiarly adapted for use in detonators, primers, etc., and for mines and torpedoes. It is estimated that the output of aniline in the United States for the calendar year 1916 was 11,000 tons.

ANILINE POISONING. The use of the anilines, and particularly of the new synthetic drugs derived from this product, has become so universal that many instances of poisoning, both acute and chronic, are observed. In acute aniline poisoning the chief effects are on the blood. It prevents the oxidation of hæmoglobin in the red blood-cells, forms methemoglobin, causes the destruction of red blood-cells (hæmolysis) and thus results in death. The chief symptoms are headache, vertigo, weakness and stumbling walk, blue color of defective blood oxidation (cyanosis), disturbances of respiration, increase of urine, which is frequently colored reddish to dark brown from the broken-down blood-cells, depression of temperature, chills, dilated pupils and death from asphyxia. The fatal dose is about 1½ drams. In non-fatal cases recovery may be much protracted. Treatment consists in withdrawal of all of the poison, washing the stomach, fresh air, artificial respiration and infusion of normal salt solution. The aniline

derivations mostly used are acetanilid (antifebrin), phenacetin, exalgen, lactophenin, methacetin, malakin, phenocoll, citrophen, apolysin, cosaprin, malarin, etc. Several aniline dyes are also used in medicine, of which the principal are methylene blue as a urinary antiseptic, scarlet red as an ointment on granulating surfaces, fluorscein, eosin and fuchsin. These dyes are also used to give an agreeable color to medicines, but they always have the same general effect. Chronic aniline poisoning, found chiefly among workers in color factories, is of much the same character, but the symptoms develop slowly. There are skin symptoms, urinary changes and various nervous attacks, with headache, tremors, changes in sensation, anæsthesia, etc. The treatment should involve the ventilation of the factories, thus getting rid of the color-dust floating in the moisture of the rooms.

ANIMA MUNDI, ăn'ĭ-mà mŭn'dĭ ("soul of the world"), an ethereal essence considered by ancient philosophers as the informing principle of the universe of matter and bearing the same relation to it that the human mind does to the body. The conception originated in the East and was held by the Egyptians. Anaxagoras (q.v.), one of its earliest Western exponents, believed that it gave form to the universe; Plato treats of it at large in his 'Timæus'; Aristotle considered the world a living entity, but informed by an external spirit. Nearly all philosophical sects dallied with the idea. The Stoics thought it the sole vital principle of the universe, but not the universe itself in a different shape, as the doctrine of pantheism imputed to them would imply. In modern times it appears in the works of Cornelius Agrippa (who calls it *spiritus mundi*), Paracelsus, Van Helmont, Giordano Bruno, Sebastian Franck, Jacob Boehme, etc., in More and Cudworth, in the later Platonists, and in the philosophy of Schelling, who has incorporated it into his whole system. See ANIMISM; PANTHEISM.

ANIMAL. The word "animal" being derived from *anima,* breath, soul, suggests the distinction popularly accorded to animals as contrasted with plants. Linné said that plants grow and live, but that animals grow, live, and feel. As will be seen below, however, animals do not fundamentally and in their simplest forms differ from the simplest plants, as both are constituted of protoplasm, which is equally contractile in both kingdoms, and we are coming more and more to speak of living beings as organisms. All organized beings agree in being formed of protoplasm, "the physical basis of life." Strictly speaking, however, an animal is a living organism, the protoplasm of which does not secrete a cellulose cell-wall, and the existence of which requires proteid material obtained from the living or dead bodies of existing plants or animals.

Differences between Plants and Animals. — It is difficult, when we consider the simplest forms of either kingdom, to define what an animal is as distinguished from a plant, for it is impossible to draw hard and fast lines between them. In defining the limits between the animal and vegetable kingdoms our ordinary conceptions of what a plant or an animal is will be of little use in dealing with the lowest forms of either kingdom. A horse, fish or worm differs from an elm-tree, a lily, or a fern in having organs of sight, of hearing, of smell, of locomotion and special organs of digestion, circulation and respiration, but these plants also take in and absorb food, have a circulation of sap, respire through their leaves, and some plants are mechanically sensitive, while others are endowed with motion,— certain low plants, such as diatoms, etc., having this power. In plants the assimilation of food goes on all over the organism, the transfer of the sap is not confined to any one portion or set of organs as such. It is always easy to distinguish one of the higher plants from one of the higher animals. But when we descend to animals like the sea-anemones and coral-polyps, formerly called "zoophytes," so striking is the external similarity between the two kinds of organisms that early observers regarded them as "animal flowers." Sponges until a very late day were regarded as plants. So-called plants, as *Bacterium* or *Bacillus* and their allies, and so-called animals, as *Protamœba,* or certain monads, which are simple specks of protoplasm without genuine organs, may be referred to either kingdom. Indeed, a number of naturalists, notably Haeckel, relegate to a neutral kingdom (the *Protista,* q.v.), certain lowest plants and animals. Even the germs (zoospores) of monads like *Uvella* and those of other flagellate infusoria may be mistaken for the spores of plants; and there are certain flagellate infusoria so much like low plants (such as the red-snow or *Protococcus*), and the slime molds (*Myxomycetes*) in the form, deportment, mode of reproduction and appearance of the spores, that even now it is possible that certain organisms placed among them are plants. It is only by a study of the connecting links between these lowest organisms, leading up to what are undoubted animals or plants, that we are enabled to refer these beings to their proper kingdom.

As a rule, plants have no special organs of digestion or circulation and nothing approaching to a nervous system. They differ from animals in their metabolic processes. Most plants absorb inorganic food, such as carbonic acid gas, water, nitrate of ammonia, and some phosphates, silica, etc., all of these substances being taken up in minute quantities. Low fungi live on dead animal matter and promote the process of putrefaction and decay, but the food of these organisms is inorganic particles. The slime molds, however, envelop the plant or low animals much as an amœba throws itself around some of the living plant and absorbs its protoplasm; but *Myxomycetes,* in their manner of taking food, are an exception to other molds and are now regarded as animals. The lowest animals swallow other living animals whole or in pieces; certain forms, like *Amœba* (q.v.), bore into minute algæ and absorb their protoplasm; others engulf silicious-shelled plants (diatoms), absorbing their protoplasm. No animal swallows silica, lime, ammonia or any of the phosphates as food. On the other hand, plants manufacture or produce from inorganic matter starch, sugar and nitrogenous substances which constitute the food of animals. During assimilation plants absorb carbonic acid and in sunlight exhale oxygen; during growth and work they, like animals, consume oxygen and exhale carbonic acid.

Animals move and have special organs of locomotion; few plants move, though some climb, and minute forms have thread-like processes or vibratile lashes (*cilia*) resembling the flagella of monads, and flowers open and shut; but these motions of the higher plants are purely mechanical and are not performed by special organs controlled by nerves. The mode of reproduction of plants and animals, however, is fundamentally identical, and in this respect the two kingdoms unite more closely than in any other. Plants also, like animals, are formed of cells; the latter in the higher forms combine into tissues.

Physiological Distinctions and Resemblances.— As has been said, the bodies of the lowest plants and animals are plainly enough made up of protoplasm. The irritability, contractibility, and metabolism of a plant-cell or a living, free unicellular plant do not differ from those of a unicellular animal (*Protozoon*) of the same morphological grade. The movements of the lowest algæ, the sensitiveness of the leaves of the mimosa-tree, of the sun-dew and other insectivorous plants, are due to the same primary cause as the movements of animals of all grades, as the power of lifting one's arm is fundamentally due to the contractibility of the protoplasm forming the cells of the muscles.

Also the differences in metabolism are not fundamental, those molds which do not contain chlorophyll and bacteria performing the same metabolic functions as regards carbon dioxide as animals. Animals are also subject to the same general tropisms as plants; they are geotropic, heliotropic, thermotropic, hydrotropic, chemotropic, etc. (See TROPISMS). To a much greater extent than formerly supposed even insects so highly developed as ants are subject to the influences of the primary factors of growth, morphogenesis, and of the conduct of life, and the instincts of animals in general are more dependent on these agents, on external stimuli, than was previously thought to be the case.

Plants Fixed Organisms; Animals as a Rule Free-moving.— While the lowest plants (*Protophytes*) are, as entire organisms, often motile, free-swimming, closely resembling monads, the higher or more specialized forms, comprising the great majority of the vegetable world, are fixed and have always remained so. It is this fixed condition of life which, so to speak, has held the plant world in an iron grasp and kept it within its natural limits. On the other hand, animals as a rule are active, free to move, restless. Whenever animals, though born as free-swimming germs or larvæ, are constrained by change of circumstances to become attached or fixed to the sea-bottom or solid objects, they degenerate and become more and more subject to the influence during growth of those cosmic and physical forces, such as gravity, light, air, currents of water, etc., which determine the shapes and morphology of plants. Fixed animals, like the polyps, sea-anemones, sponges, *Polyzoa*, etc., which lead a purely vegetable life, tend to assume plant-like shapes. Even the echinoderms, as the fixed crinoids, are plant-like, hence their name, sea-lilies. It is freedom of motion, greater activity, which have led to the vastly more complex and higher types of life in animals, to the development of a nervous system, and to the origin of mind and intelligence.

Plants Not the Primitive Basis of Animal Life.— As the lowest plants and animals are scarcely distinguishable, it is probable that plants and animals first appeared contemporaneously; and while plants are generally said to form the basis of animal life, this is only partially true; a large number of fungi are dependent on decaying animal matter; and most of the *Protozoa* (q.v.) live on animal food, as do a large proportion of the higher animals. The two kingdoms supplement each other, are mutually dependent and probably appeared simultaneously in the beginning of things. It should be observed, however, that the animal kingdom greatly overtops the vegetable kingdom, culminating in man. (See ZOOLOGY). Consult 'Cambridge Natural History' (London 1911); Bergson, 'Creative Evolution' (New York 1911); Morgan, 'Evolution and Adaptation' (New York 1903).

ANIMAL ALKALOIDS. Ptomains (q.v.) was the name originally given to a large class of products resulting from the putrefactive process occurring in animal substances. These possessed many of the chemical reactions of the vegetable alkaloids and have been termed animal alkaloids. Similar products formed in the human body, as the result of normal metabolism chiefly of lecithin, or proteids, are termed leucomains. Many of these ptomains and leucomains are highly poisonous toxins. See ALKALOIDS; METABOLISM; PTOMAINES; TOXICOLOGY.

ANIMAL CHARCOAL. See CHARCOAL.

ANIMAL CHEMISTRY, the department of organic chemistry which investigates the composition of the fluids and the solids of animals, and the chemical action that takes place in animal bodies. There are four elements, sometimes distinctively named organic elements, which are invariably found in living bodies, namely, carbon, hydrogen, oxygen and nitrogen. To these may be added, as frequent constituents of the human body, sulphur, phosphorus, lime, sodium, potassium, chlorine, iron and iodine. The four organic elements are found in all the fluids and solids of the body. Sulphur occurs in blood and in many of the secretions. Phosphorus is also common, being found in nerves, in the teeth and in fluids. Chlorine occurs almost universally throughout the body; lime is found in bone, in the teeth and in the secretions; iron occurs in the blood, in urine, and in bile; and sodium, like chlorine, is of almost universal occurrence. Potassium occurs in muscles, in nerves, and in the blood corpuscles. Minute quantities of copper, silicon, manganese, lead and lithium are also found in the human body. The compounds formed in the human organisms are divisible into the organic and inorganic. The most frequent of the latter is water, of which two-thirds (by weight) of the body are composed. The organic compounds may, like the foods from which they are formed, be divided into the nitrogenous and non-nitrogenous. Of the former the chief are albumen (found in blood, lymph and chyle), casein (found in milk), myosin (in muscle), gelatin (obtained from bone), and others. The non-nitrogenous compounds are represented by organic acids, such as formic, acetic, butyric, stearic, etc.; by animal starches, sugars; by fats and oils, as stearin and olein, and by

alcohols (two compounds, cholesterin and glycerin).

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ANIMAL COLORS. See COCHINEAL; KERMES; PURPLE SHELL.

ANIMAL ELECTRICITY, electricity which certain species of animals, particularly those inhabiting the water, have the power of producing. The amount which they can produce varies with different animals. The electric eel or torpedo can give a severe shock. Contact between the nerve and muscle of a frog will produce a feeble current of electricity.

ANIMAL EXPERIMENTATION. A method of studying disease by the use of lower animals in order to alleviate human suffering. The ancient Greeks practised it, even primitive tribes learned somewhat about human disease by observing lower animals and many human superstitions had their origin from such observations. Harvey's celebrated discoveries concerning the circulation of the blood rested upon animal experimentation, and were it not for the large increase in knowledge made possible by its methods, much of our modern civilization would have been impossible. Animal experimentation moreover has benefited all those animals which are useful to man, and most of the opposition to the application of its methods is founded upon very superficial and illogical reasoning.

The chief impetus to modern methods came after the introduction of general and local anæsthetics, such as ether, chloroform and cocaine. These substances banished all pain to the animal and permitted the delicate manipulations which were so essential to the developments of correct methods of technique.

Animal experimentation has supplanted a great deal of guessing about disease by direct methods of proving cause and effect. To give up the knowledge acquired would be to slip back into an era of barbarism, so far as medicine is concerned. No essay could be written which could possibly exhaust the innumerable benefits which every member of an enlightened community enjoys. The chief advances have been made along so many different lines that it becomes difficult to single out those of most importance. Although disease itself in the human being is nature's great vivisector, nature's methods are so ruthless and widespread that without animal experimentation the processes which we call disease could not be minutely analyzed. The insight obtained concerning the physiological processes of every kind of human activity would be impossible without animal experimentation. Harvey's monumental study and his discovery of the circulation of the blood is but one of a million discoveries which have established a true physiology. Without a sound physiology there can be no rational medicine. The knowledge of the circulation, of the digestive system, of the formation of the blood, of the ductless glands, of the kidneys, the movements of the intestines, and above all the vast and intricate workings of the nervous system — all of these have been made possible by animal experimentation.

The successful attack upon disease is no less a result of the studies on animals. Pasteur's early studies in infectious diseases were made upon lower animals. Our knowledge of every disease of infectious origin has been vastly advanced. Tuberculosis, typhoid fever, syphilis, gonorrhœa, diphtheria, all pus infections, meningitis, poliomyelitis, and one might go on indefinitely, have all been better understood and hence nearer cure through animal experimentation. It is less than a score of years since the secret of syphilis was unraveled by its methods — and syphilis kills more people every year than 10 world wars will ever kill. The excessive prudery of the human being who would rather indulge his infantile sexuality than understand it keeps this disease alive as a sort of policeman to aid in the attack upon man's essential sexual immorality. Gonorrhœa is the most widespread of all diseases, scattering the sufferings of disease wherever man goes. It is still permitted to undermine the health of a nation, because of this same prudery which calls itself morality but is a hideous mask which conceals man's immorality and lust power.

Whenever large bodies of men are assembled, as in large contract enterprises, in the manœuvres of war or similar mass actions, typhoid fever has often been a veritable scourge. Animal experimentation laid the solid foundations of anti-typhoid inoculations which have been eminently successful. The conquest of the scourge of smallpox which entered the palace as well as the hovel in Shakespeare's time has been practically eradicated through Jenner's original animal experimentations. To treat of all of the vast benefits to the farmer in the treatment of hog cholera, chicken cholera and the innumerable diseases of farm animals, which have come through animal experimentation, would alone fill a volume. Consult Cannon, 'Reference Handbook of Medical Sciences' (1913).

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ANIMAL FLOWER, a term applied to sea-anemones or similar polyps on account of the resemblance which their expanded tentacles bear to flower petals.

ANIMAL HEAT, nearly all animals possess a heat-regulating mechanism by which they maintain a temperature necessary for the continuance of life processes. In many cold-blooded animals this sustains a temperature only slightly above that of the surrounding media, and thus in winter they relapse into a torpid state. Some few, however — bees being an example — have a higher temperature and are not

torpid. In warm-blooded animals, especially those high in the evolutionary scale, a high constant temperature is usually sustained. Some warm-blooded animals occupy an intermediary position. In summer the temperature is high and constant, in winter they hibernate and the temperature is low and dependent upon that of the surrounding medium. Some cold-blooded animals living in the tropics may really show very high degrees of temperature, thus the terms warm-blooded and cold-blooded are relative only. The mean average temperature in man is 36.97° C. (98.4° F.) in the mouth, 36.98° C. (98.5° F.) in the axilla, and 37.2° C. (99° F.) in the rectum. There are slight daily variations, the lowest temperature usually being between midnight and early morning during sleep. Certain warm-blooded animals show interesting average temperatures. Thus, the horse is 99–100° F., ox 100–101° F., cow 101–102° F., sheep 104–105° F., dog 100–101° F., cat 101° F., pig 101–103° F., rabbit 101–107° F., rhesus monkey 101° F., duckbill platypus 76° F., hen 106–109° F., duck 107–110° F., sparrow 110° F. The higher the standard of heat, the less able is the animal to bear a reduced temperature. A 30° F. drop causes vital changes in a bird or animal, and death finally ensues. Fish and frogs, however, have been found to survive after having been enclosed in ice. In cold-blooded animals the temperature, as has been noted, varies widely. The study of the temperature of bees is of much interest in this connection.

Several conditions modify the regulation of the animal heat; day and night, age, muscular work, sleep, sex, race, pregnancy, idiosyncracies, surrounding temperature, season of the year, baths and certain drugs, all have a distinct influence on the heat regulatory apparatus. The variations in temperature in man compatible with life are wide; a range of less than 2° F. is normal, but variations from 75° to 112° F. have been recorded and the patients recovered. Temperatures below 80° F. and above 106° F. are dangerous.

The chief sources of animal heat are the chemical processes of the body and they are dependent on the food supply. Every kind of food has its definite percentage of heat-producing elements measured in units or calories. Thus 1 gm. (15 grains) of the white of egg has 4,896 calories; the same amount of cow's milk 5,733 calories, of fat 9,600 calories, etc. These are purely physical values, but they have their physiological equivalents. The chief sources of heat production in the human body are the muscles, the heart contraction being a very important one, and the glands (intestines, liver, etc.). Loss of heat takes place through the skin by radiation and conduction, by evaporation, from the respiration, and from the dejecta.

Regulation of these many factors is in the province of the nervous system. The vasomotor system controls the heat loss by regulating the amount of blood in the deep and superficial portions of the body, the respiratory centre regulates the amount of respiration and the cerebral cortex regulates the amount of muscular activity that is the main source of the heat production (see FEVER). Consult Kirkes, 'Textbook of Physiology' (Philadelphia 1907).

ANIMAL INDUSTRY, Bureau of. See AGRICULTURE, DEPARTMENT OF.

ANIMAL MAGNETISM. See HYPNOTISM.

ANIMAL PSYCHOLOGY. Definition. —That portion of the general science of psychology which concerns itself especially with a study of mind in animals other than man is generally designated either as animal psychology or as comparative psychology. Obviously, it would be more logical as well as scientifically more profitable to designate as animal psychology the study of mind in animals as contrasted with the study of mind in plants. In this definition animals should be used as inclusive of man. In this article the popular usage has been accepted, and the discussion will treat of the psychology of infrahuman animals.

History.— For many centuries, the human race has exhibited keen interest in the instincts, habits, experiences, and life-history of animals, as well as in their structures, bodily functions, and development. Animal psychology existed for Aristotle, who, at considerable pains and great expense, accumulated a vast and heterogeneous assemblage of facts concerning animal behavior. Modern science finds little of value in this ancient record, for the observations were uncritically made and carelessly recorded.

In the Middle Ages and later the animal soul became a bone of contention, and men sought heatedly to prove or to disprove its existence. One camp gathered facts to prove that animals are purely instinctive mechanisms, endowed by the Creator with the necessary powers to meet life's demands, and lacking will, purpose, insight and reasoning ability. The other camp quite assiduously, albeit not so religiously, marshalled evidences that intelligence, even to thought and reasoning as well as instinct, is common to brute and man.

Not until the last century did inquiry into the nature of the animal mind become fruitful of relatively disinterested and reliable results. The work of Darwin, Wallace, and their contemporaries stirred an interest in the origin, development or natural history of things biological, which shortly came to include mind. In fact, Darwin himself clearly indicated the possibility of learning much concerning the evolution of mind in animals and its growth in individuals.

In the latter half of the 19th century, especially from 1860 on, the science of animal psychology was born and vigorously advanced. England and the continent shared in this scientific achievement; but to the former belongs the credit of having produced a small group of gifted and devoted students of animal behavior. Romanes, Lubbock, and Morgan did more to create a valuable body of knowledge than had all their precursors from Aristotle onward. Their methods, like those of earlier observers, were crude, but in a measure they abandoned the use of anecdotal materials in favor of direct experimental observation and systematic inquiry.

With the present century came another notable change. The experimental method began to be applied systematically to specific problems of animal psychology. Early observers experimented more or less profitably, but usually with scant control of their materials and for ill-defined purposes. It remained for an American psychologist, Thorndike, to demonstrate the significant applicability of the

method of experimentation to the study of various important problems of animal behavior. His discussion, in 'Animal Intelligence,' of the associative processes of chicks, cats and dogs, at once brought the new science to the attention of biologists.

Presuppositions and Tendencies.— The old problem of instinct versus intelligence in animals has nearly disappeared. It is generally admitted that many animals in addition to man possess intelligence as well as instinct. To prove the existence of mind in animals, or even the existence of intelligence, is not the task of the animal psychologist. Instead, he strives to describe mind in various organisms and to formulate its laws. Certain psychologists assume that mind in some form is coextensive with life. Others believe that it appears at certain undetermined stages in organic evolution. For the one group of observers the chief task is that of discovering the forms and functions of mind in different organisms; for the other there exists the additional task of determining what organisms are conscious. Again, it is assumed by certain observers that mind, as psychic energy, is a factor in behavior, and by others that forms of physical energy are the sole and sufficient conditions of organic behavior, the mental phenomenon being, as Huxley put it, merely an epiphenomenon. Still other animal psychologists make no assumption in this matter, but patiently work toward definite knowledge of the rôle of mind in individual life and in organic evolution.

Methods.— The history of animal psychology and its present status alike indicate the prevalence of two methods and resulting kinds of psychological description,— the naturalistic and the experimental. By naturalistic observation is meant the study of animals under natural and uncontrolled conditions, usually, in a free state; by experimental observation, the study of animals under definitely controlled conditions for the solution of specific problems. Experimental work is usually done in the prearranged conditions of a laboratory.

Prior to 1900, almost all of the materials of animal psychology were naturalistic or anecdotal. They were gathered without systematic or thorough effort to control or even to describe the conditions. Such, for the most part, are the contributions of Aristotle, Pliny, Buffon, Huber, Hudson, Wallace, Brehm, Fabre, Burroughs, Seton. These writers have presented valuable accounts, as a result of field observations, of what animals do. The daily life activities of animals, their habits, instincts, education, free play, are the natural objects of interest. Specific problems are not necessarily in the mind of the naturalist. He seeks a kind of natural history of behavior and mind, and this he more or less satisfactorily attains.

Modern experimental work is directed toward definite problems for the solution of which animal and environment are alike commanded and controlled. Whereas the naturalist seeks wood and field and by patient, persistent watching satisfies himself that the young of the cat tribe instinctively captures and kills its prey, the experimentalist places his animal subject in an environment which calls forth whatever capacity it may have to respond to prey. The one observer gains intimate and valuable acquaintance with the nature of his animal and becomes sympathetically familiar with it; the other proceeds directly to the solution of his problem, often ignoring materials of extreme interest and value.

Naturalist and experimentalist are alike necessary to the progress of animal psychology. But most to be desired, perhaps, is the combination of qualifications and interest in a single individual.

Problems.— Originally, so far as human records go, the instinctive and habitual modes of adjustment to environment fascinated observers. Thus we find the ancient literature filled with descriptions of individual and race preservative activities. With the birth of a more truly scientific animal psychology, evolutionary problems came to the fore. The development of various functions now commands attention. To-day several fairly well-defined lines of research are conspicuously furthered in important centres. Of these, six seem worthy of special mention and brief consideration as indicating characteristics of the animal psychologist's interest. (1) Sensory functions; (2) the rôle of the senses, as in orientation; (3) instinctive or hereditary modes of response; (4) emotional experience and expression; (5) modifications of behavior, as in habit formation; (6) ideation and thought processes, together with modes of expression thereof.

Naturally, with these are bound up many problems concerning the functions of the nervous system, on the one hand, and the characteristics of consciousness on the other. But in the main, the present-day student of animal psychology is concerned with behavior and its conditions. If he is deeply interested in mind as a factor, he may be called a psychologist; if not, he should be called a physiologist.

Each of the six varieties of problem mentioned above may now be commented upon in order that the achievements of the science of animal psychology may be indicated.

Sensory Functions.— In no field of inquiry has more notable progress been made than in the study of the senses and their rôle in behavior. The few and crude methods of research employed by the pioneers of the last century have been replaced by varied and refined methods. Nowhere is the contrast and the extent of progress more evident than in the study of color vision.

For several decades, and up to about 10 years ago, it had been customary to test the color sense of animals by noting their responses to colored objects in nature or by arranging colored surfaces so that one color should be sought, another avoided. Food was usually associated with the color to be chosen. The older naturalists and experimentalists unhesitatingly attributed color vision of some sort to many insects and to all vertebrates.

Critical consideration of color stimuli and of the nature of animal response has indicated, during the past few years, that colored objects may be responded to specifically for various reasons, important among which are (1) color; (2) lightness or intensity of visual stimulation; (3) pattern or texture of the stimulating surface; (4) apparent distance from the eye; (5) size; (6) form or shape; (7) odor or taste; (8) temperature or electrical condition; (9) tactual quality, and so on.

Only if the possibility of response to all

other sensory factors is eliminated or controlled can the observer be certain of color vision.

To-day, instead of using two colored balls or bits of colored paper, the skilled and cautious animal psychologist demands for his study of color vision adequate physical means of obtaining pure color stimuli, of controlling them in their various aspects and of measuring both stimuli and response.

Modern experiments indicate that color vision is less widely distributed among animals than has been supposed. Mice and rats, if not also other rodents, possess little or no ability to distinguish colors. Cats and dogs, if not color blind, possess color senses radically different from the human. The color vision of bees, wasps and ants is very imperfectly known. In certain birds, color sensitivity is highly developed. This is true, likewise, of monkeys, anthropoid apes and probably of several other mammals.

What has happened in the case of color vision is happening also for other senses. The thorough study of the senses of any particular animal requires infinite time and patience. Sight, hearing, smell, taste, touch, internal senses must be studied before the life of an animal can be adequately described,—indeed, before certain of the most important and interesting problems of habit formation can be solved. The psychology of the senses is the foundation of the modern science of animal psychology. It is difficult to exaggerate its importance.

The Rôle of the Senses: Orientation.—When it is asked, how an animal can recognize and satisfactorily respond to a particular object or situation, the senses immediately come to mind, for it is their chief rôle to supply the guiding factors of response. So apparently simple a reaction as orientation with respect to a source of light is controlled, doubtless, by sensory processes. In fact, all forms of orientation to near and distant objects would appear to be conditioned by the various senses. Thus, the carrier pigeon flies many miles to its cote; the horse, dog, or cat finds its way home; the flock of birds migrates over a long distance; the nesting bird, insect or mammal locates its home spot, and each presumably because few or many of its senses are guiding it. It therefore appears that the careful study of the senses is essential to an understanding of many of the most interesting and puzzling things that animals do.

The problem of animal orientation, especially distance orientation, has been attacked experimentally by none so successfully as by the American psychologist, Watson, who has worked chiefly with white rats and terns. What Thorndike did for animal psychology in general by his pioneer study of cats and dogs, monkeys and chicks, Watson has done for the important problem of orientation.

Instinct: Hereditary Response.—Scientific progress has definitely settled the quarrel concerning instinct and intelligence, for it has been proved that intelligence is possessed by other animals than man and that instinct is widely distributed in the animal kingdom. Human intelligence differs importantly from that of any other animal, but so does the intelligence of the chimpanzee from that of the cat.

Experiments have further demonstrated that instincts are not perfect and invariable from their first appearance, but instead become modified and perfected with use. They are intimately related to habits, and in most animals form the basis for systems of habits which are developed through experience.

Studies in the heredity of mental traits and modes of response have been initiated by animal psychologists, and there are indications that the heretofore baffling problem of the origin and mode of development of instincts may shortly be solved. The modern experimental literature on instinct contrasts sharply with the older literature, for it presents definite facts in place of speculative imaginings, endless discussions, a priori definitions and theological disputes.

A single example from modern experimental work must suffice to illustrate its characteristics. By Breed, the instinctive feeding behavior of young chicks has been observed, and on the basis of controlled experiments, he is able to affirm that the pecking reaction improves in definite fashion with use, and indeed becomes the basis for complicated feeding habits.

Instinct is being brought into closer and closer relation to habit. It no longer stands apart as something mysterious, God given, unmodifiable, but instead as the hereditary or innate factor in a complex system of responses.

Emotions and Their Expressions.—Fear, anger, astonishment, joy, are being studied today in other animals as they have been studied for years in man. The animal psychologist evidently realizes that he must discover new methods to supplement those of human pyhsiology and psychology.

Most promising among the innovations is the so-called reflex method, by which the variations of some particular reflex response in connection with emotion-evoking situations are measured. Heart-beat, respiration, salivary secretion and the functioning of various other glands are being used by this method. The brilliant Russian physiologist, Pawlow, has perfected a method of using the salivary reflex in the study of the functions of the nervous system, and the method is now being adapted by animal psychologists to inquiry into the emotional or affective responses of various animals.

Modifiability of Behavior or Habit Formation.—Loeb and other physiologists and psychologists have held that the ability of organisms to profit by experience is evidence of the existence of consciousness. This criterion or test of consciousness is no longer widely accepted because of certain obvious weaknesses, but the suggestion of it stimulated observation. It appears from the results which have been accumulated that the behavior of all living beings can be modified more or less markedly and lastingly. It also appears that the nature of the modification as well as the rapidity with which it develops varies from organism to organism. Thus, whereas a single stimulation by a hot object may establish in the human infant relatively permanent avoiding reactions, the less highly organized creature, such as fish or frog, guinea pig or rat, may come to avoid the dangerous stimulus only after a number of repetitions.

Again, experimental results indicate that there are many important kinds of habits in the animal kingdom. Some involve adjustment only to present conditions; others to conditions

which are temporally or spacially more or less remote. Some are dependent upon the initiative of the animal; others upon social stimuli. Some are evidently influenced by the results of activity; others seemingly are not.

There is no single field of inquiry, not excepting the senses, in which animal psychology has made more significant or more widely influential progress than in that of the modifiability of animal behavior, habit formation, memory, imagination, the learning processes. Many new types of method have been devised, and results of obvious importance to education, to medicine, as well as to physiology and psychology, have been recorded.

The maze method, a contribution of animal psychology to biology, offers the possibility of analyzing the learning process. The sensory discrimination method enables an observer to isolate and measure the values of various important factors in habit formation. The importance of the number and frequency of repetitions of an act, the value of punishments and rewards, the mutual relations of habits and the tendency of training in one direction to facilitate or interfere with effects of other kinds of training are being persistently and successfully investigated.

Ideation and Reasoning.—The study of ideas, associative processes, thoughts, reasoning, is regarded as difficult. Thorndike undertook the task and achieved remarkably interesting results, but his lead was not directly followed. Instead, interest turned to the study of the senses and of habit formation. Only recently have the problems of complex behavior of the ideational sort been once more brought to the front.

Various forms of animal behavior, some doubtless ideational, others probably not, have been observed, and initial attempts are being made to analyze them. The methods of research are of considerable interest and may be briefly described.

Cole, working with raccoons, used a simple apparatus in which a number of levers served to present color stimuli. The color, the order or the number of visual stimuli presented indicated food. The animals learned to expect food as a reward on presentation of a certain visual stimulus or series of such stimuli. They even discovered how to work the levers for themselves in order to cause the desired stimuli to appear. Cole considers their behavior as imaginative, that is, indicating the functioning of ideas.

For the purpose of exhibiting the reactive tendencies or capacities of different kinds of animal, Hamilton devised an ingenious method and apparatus. He places his subject, animal or man, in a room on one side of which there are four doors, all closed. According to a prearranged scheme, one of these doors will open when approached by the animal and allow it to escape to food and freedom. In that particular trial, all of the other doors are locked. In the next trial, the door which previously was unlocked is locked, and some one of the other three doors will open when approached. In each 100 trials, each door is unlocked 25 times.

The question is, How will any animal meet this practical situation, ideationally or otherwise, effectively or ineffectively? As Hamilton has shown, there are various degrees of adequacy or effectiveness of response possible. These may be spoken of as types of reactive tendency.

The method of Hamilton may be used systematically to obtain knowledge of the reactive tendencies, that is, ability to solve a particular type of problem in various types of animal (he has studied cats, dogs, horses, monkeys, gophers, rats and human subjects), the same type of animal at various stages of development, as for example, in infancy, childhood, adolescence, and so on, or in various conditions of disease or defectiveness.

By Hunter, yet another ingenious means of testing for ideas has been devised and applied. It is called the delayed reaction method. The apparatus is so arranged that an animal may escape from confinement in a box and obtain the reward of food by selecting and passing through a certain exit passage. The particular passage to be selected from among others in a given trial is indicated by a light. Many animals, such as mice, cats, rats, raccoons, quickly learn to go directly to the passage which is illuminated. This habit having been definitely established, the experimenter, before permitting the animal to make definite choice of a particular passageway, turns off the light. It then becomes necessary for the animal to choose its path in the absence of the indicating stimulus. The question in the mind of the experimenter in this method is, Can a given animal correctly choose its way of escape on the basis of a signal which no longer exists, unless it be in its own consciousness or brain? If so, how long after disappearance of the indicating light is correct response possible, and what is the nature of the process by which choice is made?

It has been found that rats can make their choice correctly after being forced to wait for 10 seconds; raccoons, after a delay of 25 seconds; dogs, after 300 seconds; children, after 25 minutes. And it is conceivable that the human adult might respond properly even after an interval of many months, were the matter of extreme importance.

This ability to respond appropriately to stimuli or situations remote in time or space is indicative of what the psychologist terms images or ideas, the representative conscious process. Thus, the method of delayed reactions tends to throw light on the ideational character of animal behavior.

Yet another method of studying the associational and ideational behavior of animals involves the presentation of problems of various sorts which demand ingenuity and initiative. This is called the problem or puzzle box method. It was first extensively and systematically used by Thorndike.

The animal is placed in a box from which it may escape to food, which is visible outside, by operating some simple mechanism as, for example, a latch, bolt, lever or pedal. It is the observer's purpose to learn whether the animal can discover the relation of means to ends, or having accidentally happened upon the correct act or series of acts, can skillfully and with apparent insight perform the necessary act when next required to.

Thorndike's discussion of how cats and dogs learn to solve simple and novel problems and Kinnaman's similar studies on monkeys indicate that these animals learn very largely by a

process of trial and error. They give slight ground for the assumption that free ideas exist and influence behavior.

Those with a penchant for ideation in animals will take greater satisfaction in the experiments of Hobhouse, since he finds varied evidence of what he considers animal ideas.

As a last example of current methods of investigating ideational behavior, one devised by Yerkes may be briefly described. It, too, is a problem method. As used for human subjects, the apparatus consists of a series of 12 similar keys, any number of which may be used in a given experiment. For lower animals, a series of boxes, each with an entrance door and an exit door, takes the place of the keys.

The animal's task is to select from any group of boxes whose entrance doors are open that one which bears a particular spacial relation to the remaining members of the group, the relation having been determined in advance by the experimenter. Thus, the right box might, in one series of observations, be defined as the middle one of the group. The animal would be rewarded when it entered the middle box by presentation of food and punished by confinement in a given box each time it chose incorrectly. It, therefore, tries to make only correct choices. This is possible only if it can perceive the relation of middleness and react to it positively. Problems varying in difficultness from the extremely simple and easy to those practically insoluble by human beings can be presented by means of the multiple choice apparatus. The method promises to be fruitful of important results in animal psychology, psychopathology, and to contribute abundantly to the materials of genetic psychology.

Animal psychology is an infant science, or part-science. It has tremendous advantage over human psychology in the greater controllability of its subjects, for lower animals can be used in experiments which are either extremely difficult or impracticable in the case of human subjects. So vigorous has the new science become that its methods and results are profoundly influencing the development of the general science of psychology and contributing abundantly to the advancement of genetic psychology. See GENETICS; COMPARATIVE PSYCHOLOGY; GENETIC PSYCHOLOGY; PSYCHOLOGY.

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ROBERT M. YERKES,
Professor of Psychology, University of Minnesota.

ANIMAL WORSHIP, a practice found to prevail or to have prevailed in the most widely distant parts of the world: in India, where it is a consequence of the belief in the transmigration of souls, according to which the soul of a god may pass into the body of an animal; in the heart of Africa, where it is still in life; in South America, where very remarkable instances of it were met with by the earliest Spanish visitors; but its most extraordinary developments were in ancient Egypt. Nearly all the more important animals found in the country were regarded as sacred in some part of Egypt. Some animals were held sacred throughout the whole land, but in many cases the animals enjoyed a local reverence only; an animal that was worshipped in one nome might be an object of aversion in the next and destroyed at every opportunity. The degree of reverence paid to the sacred animals was such that the voluntary killing of one was punishable with death, and if any one killed an animal involuntarily in a nome in which it was held sacred he was punished by a fine. Throughout Egypt the killing of a hawk or an ibis, whether voluntary or not, was punished with death. So strong was the feeling of the people on this point that when it was of the utmost importance to the Egyptians that they should conciliate the Romans, even the intercession of the king was impotent to save from the fury of the people a Roman soldier who had killed a cat. The animals were regarded as sacred to the deities, and the worship paid to them was symbolical. The Egyptian idols always bore on a human body the head of the animal sacred to the god represented by the idol. Only in three cases were certain animals believed to be incarnations of the deities themselves. These were at Memphis, where the bull Apis was worshipped as an incarnation of Phtha; at Heliopolis, where the bull Mnevis was reverenced as an incarnation of Osiris; and at Mendes, where a goat received worship as an incarnation of Khem.

ANIMALCULE, the diminutive of animal; an old name applied to animals of microscopic size, and now frequently used for many *Protozoa,* such as the *Amœba* and various *Infusoria.* The term is not now used in zoology in any strict significance, nor employed in classification.

ANIMALS, Chemical Sense in. Almost all animals exhibit specific responses to chemical stimulation. In *Amœba proteus* food-particles are ingested by the formation of a sort of invagination that surrounds them, whereas this is not true of bits of inedible material. In many species of Cœlenterate we find that though contact with an inedible body produces a reaction of aversion, contact with food is followed by motions leading to its ingestion. In other cases, as with *Carmarina hastata,* though the reactions to chemical and mechanical stimulation are qualitatively similar, the local sensitivity to chemical stimulation is independent of that to mechanical stimulation. In planarians the general evidence for the chemical sense resembles that in Cœlenterates. According to Lehnert, a land planarian, *Geodesimus bilineatus,* is able to perceive the existence of food with which it is not in contact. This is the first place in the animal scale where we have evidence of any sense analogous to smell, which perceives chemical substances in the form of vapor, as apart from taste, the sensitivity of which is limited to substances in solution. This distinction, be it noted, has only meaning in land-animals. In most planarians, however, chemical stimulants only act on contact.

With the earthworm, the evidence for the existence of a specific chemical sense is very slight. Responses to chemical stimuli exist, and even to stimuli at a distance, but they are of the same nature as the responses to mechanical stimuli. The only reason for regarding the chemical sense as distinct is to be found in the different speeds of the reactions to different chemical excitants.

There is good evidence for the existence of a rather sensitive chemical sense in the echinoderms and in many molluscs. In the snail, smell is apparently most acute at the ends of the feelers, but is not confined to them. An analogous distribution of chemical sensitivity is found in many crustaceans, where the antennulæ and the mouth-parts constitute its chief, but not its sole, organ.

The first place where we find evidence of a varied and sensitive set of chemical reactions is in the insects, and more particularly in the higher hymenoptera. The marvelous powers which are possessed by bees and ants of finding their way to their hive or nest and to their food, of recognizing whether an individual belongs to their colony or not and of taking care of their young, are to be attributed in a large measure, at least, to the acuity of their sense of smell. Though the mechanism of all these actions is still a matter of the gravest uncertainty and dispute, there is evidence that in the ants of the genus *Stenamma* the perception of different sorts of odors is located in different segments of the antennæ, which are the principal olfactory organs in all insects. The individual odor of an ant is perceived by means of the tenth segment of the antennæ, the race odor by the eleventh and the nest odor by the twelfth.

In the lancelet, there is not much evidence for the separate existence of a specifically chemical sense. While fishes, reptiles and amphibians possess organs structurally and historically similar to the smell and taste organs of man, little is known about their function. The so-called terminal buds of fishes, resembling the taste-buds of man, are found not only in the mouth but sometimes over the whole surface of the body, but it is not completely established that they exercise a gustatory function. The existence of taste has been established in birds but little is known about their sense of smell. The taste and smell sensations of mammals would seem to bear a great resemblance to our own, though they are often far more sensitive, as in the dog. See TASTE AND SMELL.

NORBERT WIENER.

ANIMALS, Classification of. Classification is simply sorting out — arranging different things according to their likeness, putting them into groups. To these groups names are given for convenience in referring to them, and thus arises the terminology of this department of knowledge, which is the technical language of science broadly considered. In the present article, however, the writer purposes to confine himself to organic nature, and chiefly to zoology.

The «sorting out» alluded to above is very simple and easy at first. The child undertakes it in the kindergarten when he separates blue papers from red, square blocks from round ones, the long sticks from the short. But presently something combining more than one quality is encountered, and the question arises: Shall I put this on this pile or on that? An infant in a kindergarten who picked up a red ball might well hesitate whether to place it with the red things by virtue of its color, or on the spherical pile by virtue of its shape. This illustrates the cardinal difficulty that has embarrassed all classifiers, and has caused so great a diversity of schemes for the orderly arrangement of natural objects. Probably the only perfect classifier is nature herself, in the form of that mysterious and marvelous selector, chemical affinity. Human intelligence is less well informed as to the real constitution and affinities of the objects, animate and inanimate, that man's senses perceive, and, for the present, his arrangements of them must be imperfect and tentative. Hence classifications of the various groups, or even the limits of the groups themselves, may and do vary in at least two directions — first in the selection of a standard of comparisons, and second in knowledge or opinion of relationships.

At first, as was natural, superficial resemblances sufficed to group seemingly like objects. This brought worms, spiders and insects into one lot, classed bats with birds, whales with fishes and so on. But a closer examination soon revealed these and lesser incongruities. It was ascertained that every known bird was clothed in feathers and reproduced itself by eggs. The bat, although it flew in the air, was covered with hair, brought forth its young alive and suckled them; those were the most conspicuous and universal characteristics of

mammals. So the bat was a mammal that flew. Fishes were found to be always covered with a more or less scaly skin and breathed the air within the water by means of gills. The whales were found to breathe only atmospheric air, brought forth living young and suckled them. Plainly it was wrong to put them among the fishes, although they lived in the water — they were mammals. Thus arose the concept that fundamental structure was a better criterion by which to classify than external likeness.

Artificial Schemes.— In the early days the knowledge of animal structure was very limited. Comparative anatomy had hardly been thought of, and, indeed, arose into a definite science largely because of curiosity as to classification. Meanwhile naturalists wanted to group their facts, pigeon-hole and label their increasing information, which more and more was falling into coincidences and suggesting new comparisons and contrasts. Hence the early attempts at classification were frankly for convenience, hardly more scientific than the pigeon-holes in a clerk's desk. The crowning example of this, probably, is the "system" by which Linné (Linnæus) arranged the plants of the world.

The makers of all these "artificial" arrangements, as they were called, were ever seeking for the best, the most comprehensive features by which to work. Some were fantastic, as the "circle" theory of Macleay and Vigors; others sensible and useful. An arrangement of birds long in vogue was by the form of their feet, by which all birds were separated into several "orders" according as they were seizers, runners, climbers, etc. This was utilizing function as a criterion, and only hinted at structure.

But the untruth of this method was early perceived by some systematists who insisted that structure was the true foundation on which to erect what they styled a "natural" classification. Hence arose a classifying of classifications into two categories — the *artificial*, for convenience, as a scaffolding for study; and the *natural* as an expression of real truth. To some extent these lines of thought and work still exist, but the former has been nearly abandoned.

Seekers after truth of relationship by study of structure — forms of organs, morphology — increased in number from the early 17th century onward, and their accumulated information, published in various partial schemes, together with his own extensive investigations, gave material for the first grand generalization in zoology — that by Georges Cuvier (1769–1832), whose fame was popularized in this country by the most talented of all his pupils, Louis Agassiz, himself a great investigator and the author of a remarkable "Essay on Classification."

Cuvier's "Plans of Structure."— Cuvier thought himself able to separate animals into four groups, distinguished by four "plans of structure," which had been assigned by the divine Creator, and which were of equal rank. These were: (1) *Vertebrata,* characterized by an internal skeleton, an essential part of which was a backbone; it comprised mammals, birds, reptiles (including batrachians) and fishes. (2) *Mollusca,* characterized by a massive type of body, without bones; the mollusks, brachiopods, tunicates, etc. (3) *Articulata,* with bodies composed of ring-like segments; the insects, crustaceans, annelids and spiders. (4) *Radiata,* characterized by a radial arrangement of all the parts around a vital focus; star-fishes, polyps, worms, and animalcules.

Those four "plans of structure," ordained from the beginning of things, Cuvier regarded as great facts; and Agassiz objected to all those like Leuckart, Vogt and others, who criticized or modified this arrangement, that they were considering too much complexity of structure and losing sight of "plan" or "type." Agassiz pointed out that Cuvier's divisions combined their various subdivisions; and that this was a great step forward, even if he had not the correct measures for all his groups. "For we must remember," said Agassiz, "that at the time he wrote naturalists were bent upon establishing one continuous, uniform series to embrace all animals, between the links of which it was supposed there were no unequal intervals." The watchword of their school was "Nature makes no leaps"; they called their system the "Chain of Being."

Nevertheless these views were not accepted by all investigators. One after another the leaders in biological science proposed modifications, especially as to the *Radiata.* Ehrenberg in 1836 departed altogether from the Cuvierian notion, and laid down the principle that the type of development is one and the same in all animals from nomad to man; that is, he set aside the idea of "plan," and erected a classification on purely anatomical grounds. That of Owen, a few years later, had a similar basis. Both assembled in their schemes groups that were heterogeneous, and gave varying rank to similar aggregations. The result was that neither was much accepted. Von Siebold, in 1845, added to Cuvier's four plans or types of structure two more — *Zoophyta* and *Vermes* — asserting that they had equal rank with the others, and Leuckart accepted them. Later Von Baer, the great embryologist, offered a classification based on mode of development from an egg to maturity, and other embryological systems were made by Van Beneden, Rolliker and Vogt.

All these men multiplied facts, cleared up subordinate relationships, and, by the different angles from which the subject was viewed, broadened knowledge immensely. The effort of all was to find a standard that could be applied uniformly, and would necessarily reveal the true place in nature of every living thing. If a perfect order in organic nature existed, then approaches from the point of view of the embryologist and from the point of view of the anatomist ought to arrive at the same result — the real condition — the truth. Thus far it had not done so except in favorable cases. One method would logically assign an animal, a plant or a well-defined group to a certain place in the system which would be quite negatived by other considerations.

Search for "Natural" Scheme.— Facts of biology accumulated, but a connected system for "natural" classification of them eluded all searchers. That this should be the case is not surprising when one recalls that it was believed by all the older zoologists, except a few advanced thinkers, whose views were usually scouted, that the individuals of each kind of animal were descended from their own peculiar

ancestor; that this original pair was totally unconnected with the ancestor of any other line, having, as Buffon asserted, "participated in the grace of a distinct creation"; that a species so created was forever unchangeable.

Classifiers sought to perfect their appreciation of resemblances, and constantly used the word *relationship,* but this term, when employed with reference to two kinds of animals having a wholly independent origin, was of course used in a purely metaphorical sense. It was not until the prevalent idea outlined above was discarded that *relationship* took on its real significance and became the key-word in classification; and this came about only when the doctrine and facts of organic evolution — that is, transmutation of forms of life through variation in descent — destroyed the earlier conception of the origin and history of living things on the globe. Then it was that all the avenues of inquiry (anatomy, embryology, geographical and geological distribution, adaptations to habits, etc.) led to the same point, indicated the true place in nature of each animal or group — true because it had become so by developmental heredity. Instead of four or six or some other number of parallel "plans" of immutable structure, it became plain that animal life and plant life represented only one progressive, enlarging and ever-varying scheme of adaptative and fruitful beings.

This compelled the discarding of another old assumption, one on which, in fact, all previous schemes of classification had rested, namely, the existence and fixity of "species." This word came into use in zoology and botany at the beginning of the 18th century, when John Ray applied it to indicate a group of animals and plants with common characteristics that would interbreed freely. (This last test has been popularly considered definite, although not universally true.)

"Linnæus," says Prof. William B. Scott in his 'History of Land Mammals' (1913), "regarded species as objective realities, concrete and actual things, which it was the naturalist's business to discover and name, and held that they were fixed entities which had been separately created. This belief in the fixity and objective reality of species was almost universally held until the publication of Darwin's 'Origin of Species' (1859) converted the biological world to the evolutionary faith, which declares that the only objective reality among living things is the individual animal or plant."

Descent the Test of Relationship.— This conception upset completely all previous methods of determining relationship — the basis now, as always, of classification; and gave to that word a new and proper definition, namely, association by blood-connection derived through descent from the same stock.

The term had been so used with reference to human affinities, and this meaning was now extended to all living things, as was right and natural. A man's relatives are those who belong to the same family-stock; the relationship between them is one of blood and inheritance. The same is true of horses, or sparrows, or fishes, or snails. Any recognizable relationships are those produced by common descent; and when these are unrecognizable the search for them must be along lines of ancestry. Hence the vast service of palæontology has rendered to classification of living things — the same kind of service for the brute world that the study of genealogy has rendered to human history. Palæontology reveals the genealogy of the animal world so far as its materials permit.

Genealogy, then, is the guide to the classification of the individual, whether human, quadruped, bird or lowly worm; and the old-fashioned "plans of structure" are merely helpful indications of probable community of descent. They exhibit the groups that have resulted from the more or less gradual variations, prehistoric divergencies, and frequent extinctions of intermediate lines, that have affected the descent of animal life from some original source. Biological classification is the expression of heredity.

The matter is commonly symbolized by a tree growing from seed and root to trunk, splitting into limbs that spread out in various directions, putting forth lesser divergent branches and finally innumerable twigs. Many branches flourish to the very tip; others remain short; others produce twigs; others die and disappear. Species are the latest twigs; the lesser branches from which they spring may represent genera, families, orders, and classes, until at last the root-trunk is reached. The figure is incomplete and inadequate, but is helpful.

The newest, that is the most modern and simple manifestation of arrangement in the living world, is the *species,* which we may now define as an assemblage of individuals more closely related by common descent to one another than to anything outside their class. All the members of a species will interbreed, and, as a rule, will not interbreed with any other species, or at least will not produce fertile offspring. Some species are very distinct in their characteristics, others vague; some are exceedingly numerous, others contain few individuals; some are strictly local in their habitat, others exist over an immense area; some appear modern in their origin, others may be traced far back in the zoological record; some are remarkably uniform, others vary largely, so that systemists create "sub-species" or "geographical races" to demark their variations, which some regard as "nascent" species.

The species, then, is the unit of classification, and its characteristics are mainly external peculiarities of contour and color, which by their very nature are impermanent. Let us take as an example of a species our common cat, which is, in the main, simply a domesticated form of the Egyptian wildcat, known in zoology as *Felis libyca.*

The earliest naturalists gave long descriptive names to animals and plants. Ray, Linnæus, and students after them have reduced these to two, and have used Latin (or Latinized) terms in order to identify the subject in all languages, and thus avoid the confusion and inaccuracy of vernacular names, which often are applied ignorantly or carelessly to very different creatures. Our Canadian moose is virtually the same animal as the elk of northern Europe; but the "elk" of this country is not that at all but a deer closely related to the red deer of the Old World. A Japanese has no trouble in distinguishing them, however, when he reads of *Alces malchis* (the European elk)

and *Cervus canadensis* (the American "elk"). This is called the binomial system of nomenclature; and sometimes geographical varieties are designated by a third (trinomial) name, as *Sturnella magna argutula*, our Western meadow-lark.

After this digression on the form of specific names let us resume our account of the development of the scheme of arrangement of animal life.

Relative Rank in Classification.— As one surveys the world he finds two or more species with a certain close resemblance that separtes them from others, and these he unites into a secondary group called a *genus*.

For instance, kinds of cats, different in habitat, size, coloring, etc., have the same general features of a comparatively elongated body, long tail, and small, plain ears; they are united in the genus *Felis*, with different specific names, as *Felis libyca, Felis catus, Felis leo*, etc.— the binomial being the generic and the specific name used together like Smith, John; Smith, George, and the like. But there are other kinds of cats that agree in having heavy bodies, short tails and tufted ears. These are recognized as forming another genus *Lynx*, and we have of these several species, as *Lynx canadensis, Lynx pardalina*, etc.

These several genera may now be united by common characteristics into a higher group called a *family*, the name of which in zoology always ends in the suffix *idæ*, and is likely to be taken from the name of the most prominent genus as *Felidæ*, the cat family. (Large families are often subdivided into sections or subfamilies designated by the termination *inæ*). This family group is based on a combination of the features that ally all its constituents, and at the same time separate it from other groups of equal rank, and these are usually features of structure, rather than of form or appearance, such as the form and number of the teeth, adaptations of limbs to a special mode of life, etc. Sometimes these are very marked. For example, the family of the cats differs from that of the dogs or bears or weasels in having claws that may be withdrawn into a sheath — a distinction of family rank. The cattle family (*Bovidæ*) includes a wide variety of forms — neat cattle, sheep, goats, and antelopes — but is separated from the deer family (*Cervidæ*) by the fact that all have hollow but permanent horns, while the deer have solid, deciduous horns (antlers). It is such broad characteristics that make family rank; and now and then families represent divergencies from their allies so great that only a single genus, perhaps containing but one species, is given family rank. This is the case with our American pronghorn.

The fourth rank is the *order*, containing a collection of families believed to have consanguinity or descent from a common stock. To determine this by the detection of a common characteristic, usually of intimate structure, is sometimes easy, as in the case of the order *Carnivora*, or beasts of prey, whose sign is the character of the teeth, and particularly the presence of the prominent canine tooth, so strongly developed in the cats, which are highly representative of that order. Orders are usually large and comprehensive groups, and often may be divided into well-marked sub-orders, as, in this instance, the *Pinnipedia*, or fin-footed carnivora (seals and walruses) and the *Fisipedia*, or toed carnivora (land beasts of prey); and most orders include several extinct families. It is probable, also, that the Carnivora and certain others ought to form a super-order *Creodonta*, ancestral to them. When one is dealing with groups as large and widely separated as orders, is it possible to discover any features possessed by all that will enable us to collect them into a still higher group? It seems doubtful, when one recalls the diversity in the one group alone chosen for our illustration. Here are 11 orders (not counting extinct ones) represented by animals so diverse as the duckbill, kangaroo, sloth, ox, manatee, whale, cat, mouse, mole, bat, and man. Have they anything in common? Much; and particularly two prominent features that separate them from all other animals — their covering of hair, and their nourishing their newly-born young on mother's milk. Hence they go together into a still larger group called a *Class* — the class of mammals (*Mammalia*). In this class are two sub-classes, *Prototheria* (duckbill and the echidnas), and *Eutheria* (all other mammals).

The mammals are equal in rank with the classes Birds, Reptiles, Amphibia, Fishes, Round-mouths, and several others formerly regarded as worms or mollusks, all of which possess one feature of prime importance — a notochord, the prototype of the spinal cord and backbone of the more highly developed forms. This unites these otherwise so varied classes into a still broader aggregation or "phylum," the *Chordata*. Beyond this are only two words —*Animal* and *Plant*, indicating the two grand kingdoms of life in the world. Even these, however, are so essentially alike in their simplest form, the monad, that they are doubtfully distinguishable at that point of contact, and may be combined under the term *organism*.

Here, then, ends our inquiry into the place in nature of our example. The animal organism called "cat" is a chordate, eutherian, carnivorous mammal of the family *Felidæ*, genus *Felis*, and species *libyca*.

Such is the schematic history of a single animal, and it represents not only its place in nature, but its phyllogeny, that is the line of its evolution from a primitive monad to the complexity and finish of an animal highly adapted to a certain manner of life.

Biological classification is now, therefore, on a sure, philosophical, scientific basis. It has but one principle — that of descent — blood affinity. The problems are those of perception: to detect the evidence of genetic relationship. To this every fact of investigation, from the embryologist's microscope and the anatomist's scalpel to the geologist's hammer and the field-naturalist's notebook, contributes; and no longer is any artificial grouping possible, except on account of an ignorance that study will correct, or as a theoretical suggestion that must be proved before it is acceptable.

In the present article only a single kind of animal has been considered. The process is the same for all others, but different criteria must be employed in the various groupings, and even different terms used, or the same term with different limits. Thus "family" is a far more comprehensive and important group in

botany than in zoology. Moreover the diverse temperaments of classifiers lead them to vary in closeness of distinction. Some men see specific or generic differences that others do not admit, wishing to ignore the minute differences that the former deem important. The tendency is toward the broader view.

ERNEST INGERSOLL.

ANIMALS, Cruelty to. The earliest laws for the prevention of cruelty to animals were passed in England, whence the movement spread to the Continent, and the United States. The first society for the prevention of cruelty to animals in the United States was chartered in 1866; and the agitation by similar societies has resulted in laws in almost every State providing for the punishment of cruelty to domestic animals by fines from $5 to $100, imprisonment from 30 to 60 days, or both. These societies work also to prevent cruelty by education, advice, and personal effort in enforcing the law.

ANIMALS, Diseases of. Domesticated animals suffer from a large number of diseases. They are the cause of the greatest loss to the animal industry of the country. Considered economically, the infectious diseases alone are conservatively estimated to have caused a direct loss to this country of $212,000,000 in 1915. The indirect losses and those from other disorders can neither be determined nor approximately estimated. The diseases of animals may be divided into three groups, namely: (1) general diseases; (2) specific infectious diseases; and (3) those caused by animal parasites.

The *general diseases* are physical disorders that result from improper care of the animals, including food and shelter, and those that are produced by infections that result in local inflammations leading to abscesses, ulcers, local tissue necrosis, or a more general disturbance such as bacteriæmia or blood-poisoning. The different species of animals vary in their power of resistance to common infection. The horse kind is quite susceptible while the bovine species are more resistant to wound infection, and fowls are practically immune to ordinary pyogenic bacteria.

Animals suffer quite extensively from inflammations and degenerations of the various organs and tissues the causes of which are not very satisfactorily explained. It is believed that autointoxication is the origin of many of these conditions. Disturbances of the digestive tract as observed in various forms of indigestion or colics, and inflammations of the stomach and intestine are common, especially among horses and cattle. McCollum of the Wisconsin Agricultural Experiment Station has recently pointed out that the essential *growth promoting substance* is not present in many proteins used for animal food and consequently a ration that is generally considered to be proper may be unbalanced and consequently would lead to more or less serious disorders, although the quantity of food was abundant.

Many local diseases start from wounds or injuries. Cattle often suffer from traumatisms resulting from swallowing nails, pieces of wire or other pointed metallic articles which pierce through the walls of the stomach. Frequently they injure the heart causing traumatic pericarditis.

Poisoning is a serious source of loss. There are a number of poisonous plants which occasionally cause the death of animals that eat them. Cattle are very susceptible to lead and not infrequently they are poisoned by licking an emptied lead pail or a newly painted fence or barn. Other poisons such as arsenic and corrosive sublimate are occasionally the cause of death among animals.

Animals suffer to a considerable extent from tumors. Cancers, epitheliomas, sarcomas and leukæmia are quite common. Melano-sarcomata are more numerous in the horse and leukæmia or the so-called lympho-sarcoma in fowls. Benign tumors, especially those arising in the connective tissues, are also frequently encountered.

The *specific infectious diseases* are those caused by definite pathogenic bacteria, fungi, protozoa and the filterable viruses. Each disease is produced by its specific organism and by no other cause. For example, anthrax is caused by *Bacterium anthracis*, Texas, or Southern, cattle fever is caused by *Piroplasma bigeminum*, foot and mouth disease by a filterable virus, that is, a specific substance that will pass through filters (Berkefeld) that keep back ordinary bacteria. The specific infectious diseases are sometimes confused with dietary disorders. They can be readily differentiated by taking into account the following:

Cause.— An infectious disease is produced by a specific virus. This necessitates as the first requisite an exposure to and an infection with the specific organism. Ordinarily but a few animals in a herd are infected simultaneously.

Period of Incubation.— The infection must be followed by a certain time required by the invading micro-organisms to become established in the body and to bring about the first symptoms of the disease. According to Vaughn it is the time required for the infecting organism to sensitize the tissues. The incubation period varies in different diseases, and, to a certain degree, in the same disease, according to the mode of infection, the virulence of the organism and the resistance of the individual. Usually, however, it is practically the same for all individuals of the same species when subjected to the same mode of infection.

Lesions.— The tissue changes in an infectious disease are usually nearly the same in all the animals affected in the outbreak. Each pathogenic organism brings about tissue changes more or less peculiar to itself. They may, however, vary within rather definite limits. They may also be acute or chronic in nature. The cause for the changes in the body is the action upon the tissues of exogenous and endogenous toxins (bacterial proteins), or the mechanical blocking of the vessels by the organisms. In many epizoötics, the disease appears in an acute form in the first animals attacked while those infected later suffer from a chronic or modified form of the affection. In other outbreaks, the first cases are chronic in nature and the later ones acute. It is important to distinguish between the lesions due to the virus and secondary tissue changes that may be present.

Duration.— In animals, as in man, most of the infectious diseases are self-limiting. After they run a certain time the animals either die

or fully recover. As a rule, the percentage of fatal cases in an outbreak is larger among animals than with people.

Transmission by Inoculation.— Finally, in making a positive diagnosis it is necessary to find the specific organism, or to prove the transmissibility of the disease from the sick or dead animals to healthy ones. The extent to which the disease spreads will also aid in determining its infectious or non-infectious nature. In diagnosing an epizoötic disease, investigations have shown that too much reliance cannot be placed on the period of incubation, or the morbid anatomy. There are many possibilities, therefore, that an erroneous diagnosis may be made when the symptoms or tissue changes are alone considered.

Diagnosis.— The accurate diagnosis of a specific infectious disease is made by taking into account one or more of the following: (1) The symptoms; (2) the lesions or morbid anatomy; (3) the specific cause; and (4) specific reactions. The value of symptoms in making a positive diagnosis varies with the disease and often with the individual case. While each disease exhibits a somewhat constant chain of symptoms it is also true that there is a striking similarity between the symptoms exhibited in many different diseases. As a rule it is difficult to make a positive diagnosis from the symptoms alone.

The changes produced in the tissues by a specific micro-organism are usually constant in their nature. They represent the result of the reaction of the body tissues to the particular invading organism. In some diseases, like rabies, the characteristic tissue changes are microscopic and cannot be determined from the gross examination of the organs. It is very important in making a diagnosis from the lesions that the specific tissue changes be recognized and that they be accurately differentiated from other tissue changes that often accompany such diseases.

The positive diagnosis is made when the micro-organism that caused the disease is demonstrated in the morbid tissues. In some diseases, such as anthrax, this can be done by very simple bacteriological methods. With other affections it requires very careful and special methods to isolate, cultivate or even to demonstrate the specific organism. There are, however, several epizoötic diseases, such as foot and mouth disease, for which a specific organism has not been isolated.

It has been found that animals suffering from certain infectious diseases will react to the injection into the body of the specific protein of the organism with which they are infected. Thus, if mallein is injected into a horse suffering from glanders, a definite reaction will occur which can be considered specific for glanders. There are also certain substances given off by the tissues into the blood that have a specific affinity for the antigen or species of organisms that cause the infection. There are a number of these so-called specific reactions employed in diagnosis. The more important are the reactions caused by mallein, tuberculin and other like substances, the agglutination test and the complement fixation test. When a reaction occurs with these tests it is generally considered positive evidence that the disease is present.

Control.— The control or eradication of the infectious diseases is of the greatest importance. This can be accomplished by (1) preventing the spread of the germs which cause them, or (2) immunizing susceptible animals against them.

The checking of the spread of infectious diseases involves an intimate knowledge of the organisms that cause them. It requires that one should know: (1) When in the course of the disease the virus is eliminated from the body and the channels through which it escapes. (2) What happens to the virus after it leaves the body and how long it will resist the action of external influences such as drying and sunlight. (3) By what means and through what channels it gains entrance to the body of the uninfected animal. When the facts regarding these points are ascertained it is not difficult to determine what should be done to prevent the virus from spreading from the animals in one herd to those in another, or from a sick individual to a well one in the same herd.

Immunization.— The immunizing of animals against either sporadic or epizoötic infectious diseases has been found to be practicable with certain diseases such as anthrax, black leg, hog cholera and possibly a few others. This method is valuable in those diseases where it is possible to establish an artificial immunity. It cannot be employed satisfactorily with others. The danger in this method is, that where it is employed, precautions against infection are usually minimized and consequently if the protection is not complete it gives a false security. The immunizing processes for the control of infectious diseases are based upon the principles of immunity and the methods for its production.

Parasitic Diseases.— These are morbid changes brought about by animal parasites that are large enough to be recognized without the aid of a microscope, although diseases caused by the protozoa and even bacteria may be considered parasitic. Animal parasites cause a number of disorders that are serious and some of which, such as the nodular disease of sheep and taeniasis of fowls, are frequently mistaken for tuberculosis. There are many parasites and a discussion of their classification or the disorders they produce that would be at all adequate would require many pages. Some of the parasites attack the exterior of the body; others live in the digestive tract; others occur in the lungs; others find their way into the organs; and a very few appear in the blood. Many of these have a serious effect upon the animal and the losses occasioned by them are heavy. In addition to the direct injury to their hosts, a few parasites of animals are transmitted to the human family. Among these may be mentioned certain of the tapeworms and trichinella or the worm which causes trichinosis in rats, swine and people.

To summarize, the bodies of living animals are subject to a great variety of deviations from their normal condition due to unsuitable conditions of living, to infections of many kinds and to the irritation of animal parasites. These may produce changes ranging from the slightest possible irritation to the destruction of the host. See also CATTLE, DISEASES OF.

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V. A. MOORE,
Director New York State Veterinary College, Cornell University.

ANIMALS, Distribution of. See GEOGRAPHIC DISTRIBUTION OF LIVING MAMMALS.

ANIMALS, Domesticated. A very large part of man's success upon the earth and of his achievements in supremacy are due to the animals that he has been able to draft into his service through domestication. They have fed him, clothed him, carried him and his burdens, cultivated his fields, drawn his machinery and have in every way surrendered their lives to him and his purposes.

Originally from the Wild.— Like the crops of the orchard, garden and field, the domesticated animals all came originally from the wild. Choosing for his purposes such of the wild animals about him as could in his opinion assist in his enterprises and as were sufficiently docile to lend themselves to his mastery without too much difficulty and danger, man while yet in the primitive state took absolute possession of certain species, although one of his first attempts was with the wildest of the wild, the horse.

Sources of Material.— The dog is the direct descendant of the wolf, found in the wild the world over, with possibly a dash of the fox in certain breeds. The horse is the direct descendant of the wild stock of central Asia. The ass comes also directly from the wild in western Asia and northern Africa. Common sheep are undoubtedly descended from the native stock of northern Africa and southern Europe, and the fat-tailed variety from that of western Asia. Almost every country of the earth had its wild variety that might have been developed into the domestic pig, but strangely enough we owe our present stock to a foundation developed in southeastern Asia, improved by a later dash of the wild boar of northern Europe.

In general our poultry came from southeastern Asia, except the guinea from western Africa, the goose from northern Europe, the duck which is cosmopolitan from the subarctic regions, and the turkey which is a truly American bird — our only contribution to the domesticated animals — from the New England woods or the jungles of Mexico.

The elephant of India and Africa, the camel of Asia, the water buffalo of Asia and Africa, the humped cattle of India and the yak of Tibet are all developed from native stock, and in general every country has drawn upon its own resources for domestication except that America, being suddenly settled and at a comparatively late date, was stocked by importation, the supply coming largely from western Europe.

Degrees of Domestication.— Species differ greatly in their response to the ameliorating effects of domestication. Probably no animal is so thoroughly under the influence of and so completely responsive to his master as the dog, and none less responsive than the cat, though both have been long attached to the domiciles of man.

Most domestic animals will come at call, but few have the homing instinct sufficiently developed to offset their native wanderlust or their natural disposition to forage for food. The result is that most animals must needs be kept in more or less strict confinement. The pig, if unrestrained, will wander wherever food is to be found. Sheep will go in flocks or bands and follow a self-appointed leader anywhere. Though every cow knows her stall in the barn, she will wander aimlessly across country and, except in rare cases, stop with perfect satisfaction wherever night overtakes her. Some horses "know the way home"; others are absolutely lost and indifferent as to their whereabouts. Even the trusted saddle horse responds to the call whenever a band of wild horses comes his way. The cat with all her lazy luxury goes wherever she is fed most liberally, and even the dog, most faithful of all servants to his personal master, easily turns tramp, making friends with everybody, and responsible to nobody, clearly demonstrating how strong after all is the call of the wild.

Domestication is at best a relative term, some species responding much more freely than others, the whole process shading off into that border land, where song birds are bred in cages and gold fish in bowls, and where the response of the animal is exceedingly problematical.

Quite aside from true domestication is that voluntary association of rats and mice with the habitations or rather the storehouses of man, not from any instinct for human society but purely from an attraction to food and warmth not far removed from the blind principles that bring weeds into the crops or parasites upon the body.

Purposes of Domestication.— Domestication means responsibility for food and whatever shelter, restraint or attendant care may be necessary. This all means heavy expense of time and money, so that the domesticated animal, while exceedingly serviceable, is at the same time extremely expensive, as will be seen when we compute the value of the hay, oats and corn crops, practically all of which go to the support of animals. Considering this fact, it is evident that man has domesticated for strictly personal reasons, never for the welfare of the animal.

Animals Domesticated for Hunting.— The primitive man, in constant distress for food, hunting animals that were in every way his superiors except as to wits and a serviceable hand, must have early noted the habit of the wolf to hunt in packs. He was not long in finding that a litter of young pups brought up in camp became extremely loyal and still retained their hunting instinct. In this way the hunter obtained his dog. To the dog were early added the horse, the elephant, the chetah or hunting leopard, the falcon or hunting hawk and last of all the ferret.

Animals Domestcated for Their Meat.— Here must be counted the ox — excepting the humped cattle of India not used for food — the sheep, the pig, the goat, the rabbit and a horde of birds — the chicken, the guinea, the goose, the duck, the swan, the pheasant, the peacock, the pigeon, and greatest of all the turkey. Rarely, except in war, has horse meat been offered for sale. In general it is coarse and of poor quality, while sentiment is against its use for food.

Animals Domesticated for Their Milk.— Though the milk of all domesticated animals is sometimes used, yet it would be fair to say that probably the only animals domesticated mainly or even largely on account of their milk are the cattle, both plain and humped, the goat and the ass.

Animals Domesticated for Their Labor.— Though the horse like the ass was domesticated for riding, he has been put to all kinds of work in Europe and in North America, seldom in other parts of the world, where he is held superior to menial tasks. The ox, both plain and humped, the ass and his hybrid progeny the mule, the water buffalo, the elephant and the camel, the reindeer and the dog, all have been commonly put to hard labor, and up in Tibet the yak is no exception to the rule that man under almost any conditions will contrive to find some animal to bear his burdens and perform his hardest labor — even drafting in the llama.

Animals Domesticated for Their Body Covering.— The skin of most animals is valuable for tents, for clothing, and for the thousand and one occasions in which leather is desirable. The horse, the ox, the sheep, the pig, the goat, the dog and the rabbit all yield valuable skins, especially the ox and the goat. Modern methods of tanning make even the tender sheepskin extremely useful for many purposes. One of the original objects in domesticating the sheep was its wool, first as attached to the skin, afterward for spinning into yarn and cloth. The same principle governs the semi-domestication of the vicuña and the alpaca; indeed, one of the marvels of early civilization was the skill developed in weaving. Latterly with the decreasing supply of fur-bearing animals, both the fox and the skunk are artificially produced under conditions of semi-domestication.

Animals Domesticated for Their Eggs.— Eggs have long been in standard demand for food, and however much our poultry may have been domesticated for its meat, the egg supply doubtless played no secondary part in the reasons for dealing with so troublesome a lot of animals. Preferable as are the eggs of the chicken, those of all domesticated varieties of poultry are sometimes used, and even so the supply is not sufficient to meet the demand, which is very largely satisfied by drawing upon the nesting places of sea fowl.

Miscellaneous Objects of Domestication. —Aside from the ordinary and more obvious reasons for domestication there are certain secondary objects such as feathers from the goose, the swan and especially the ostrich; honey and wax from bees; and last of all should be mentioned the raising of the guinea pig for purposes of experimentation especially along pathological and physiological lines, as well as in tracing the principles of descent.

Animals Domesticated for Pets.— It is doubtful if ever an animal was domesticated primarily for other than strictly utilitarian purposes, but once domesticated the response was often so instant and pronounced as to lead to real affection between master and servant. This explains the hold of the dog and the cat upon popular favor, even when their natural service is not needed. Horses are quite commonly kept primarily as pets, and no other impulse can explain the present day use of the swan, the parrot, the peacock, the pheasant and certain strains of the rabbit, the dog and the cat, not to mention gold fish and canaries.

Native Characteristics of Domesticated Animals.— What might be called the psychology of wild species would make an interesting study; for example, the two most faithful of all domestic species are the dog and the horse, yet in the wild state no animal is more cowardly than the wolf, and none more warlike than the horse. Cattle for the most part are indifferent to man, while sheep will follow him anywhere. The response of the cat to domestication is apparent rather than real. She enjoys warmth and soft places on which to lie, but it is a question whether in general the domestic cat has acquired much response to man, particularly when we remember that as large and savage a cat as the puma is creditably reported as never under any circumstances attacking a human being. The manner in which the rat and the pig respond to training is as unaccountable as is the limited intelligence of the sheep and the cow, or the substantially opposite reaction of the horse and the ass to objects of fright, the one tending to run away and the other to investigate.

Improvement under Domestication.— Quite naturally man selected for domestication those species that served him best. Not only that, he picked the particular strains and varieties that fitted his needs the closest. He followed the same principle in breeding. Was it meat he desired? He bred from the heaviest fleshed individuals. Was it milk? He chose those of the heaviest flow. Was it wool? He bred from the specimens of the longest and finest fibre. Was it labor? He bred from the strongest, or if for speed from the fleetest. So it is that the domesticated animals have, generation by generation, become constantly a little more completely adapted to the needs of man, and favorite species like the dog, the horse and the ox have been broken up into numerous breeds of all sorts and sizes, each adapted to serve the particular need or whim of a group of men sufficiently large to create a demand. Thus was laid the foundation of the science of breeding by which the domesticated species will be yet more closely adapted to the needs of man, and yet more completely freed from certain accidental but unwelcome characteristics, such as weakness of constitution, tendency to sterility, bad temper and lack of intelligence.

Unused Materials.— If the world had all been settled at once, undoubtedly every section would have developed out of its own material

its proper domesticated races. But America lagged behind. Her excellent start toward a horse had come to an end in Montana at the four-toed stage, and she had nothing to take its place; hence the backward state of the Indian, and hence the certainty of importation. She had the bison which might have been domesticated, but already the European bison had been neglected for its better compatriot, the ancestor of our common cattle. She had a pig, but she could not afford to stop to build it up in competition with what had been gained by long years in Asia and Europe. She had the turkey, and nothing under domestication was its equal for the feast, and consequently the peacock and the swan have been neglected at modern banquet boards. The prairie hen or the partridge of the woods might have afforded a domestic strain, but the chicken was better and so the natural supply was unused. The bear might have been domesticated to advantage, and no doubt he may yet follow the fox and the skunk as a denizen of the fur farm.

Be that as it may, a wealth of material was left over and neglected, not only here but in that great storehouse of raw material, central Asia, only because man had already all he could use to advantage.

EUGENE DAVENPORT,
Dean and Director, University of Illinois College of Agriculture.

ANIMALS, Mind in the Brute. Like other phases of psychology, that which concerns itself with the minds of non-human animals has broadened considerably in the few years just gone — so far at least as actual research-reports are concerned. How far a questionary investigation would show the acceptance of the new liberalism among psychologists in general it is difficult indeed to be sure, since (as we see in regard to the subconscious aspect of mind) many scientific men when asked will admit the existence and even the importance of a thing which yet they wholly ignore in their own spontaneous work. Specialization is overdone in psychology as elsewhere, and few academic psychologists venture to attempt the correlation between the human and the brute.

Whatever may have been the motive of Renè Descartes for seriously declaring that of all the animals only man was conscious (perhaps it was due to his predominant ecclesiastical or to his mathematical interests) no one, perhaps not even himself, ever believed the dictum any more than that his will is not free, however loud, or even however good, his arguments.

The twin-principles of *analogy* and of *continuity* teach everyone, who is not prejudiced by some underlying system of belief, that the "lower" animals are conscious like ourselves; in proportion, however, to their complexity, both of environmental relationship and of functional internal relationship.

The sceptic who admits consciousness in himself but denies it in the dog and elephant and lion has one resource which he is bound to make use of continually. He can deny *the principle of continuity* in organic evolution and claim that the protoplasm of man is essentially different from that of all other animals, and that the difference is such that consciousness may inhere in it and not at all in the brutal organism, the consciousness accruing to it suddenly as if out of Pandora's box. So arbitrary, however, is this supposition, so gratuitous in the biology of protoplasm, that it may be disregarded, the burden of proof resting wholly on its claimants. So far as every evidence goes, structural and functional, the two classes of animals compared, brute and human, are built on the one same plan, live in the light of the same consciousness, save probably for ratiocination, which has perhaps developed the vast complicating of the connections of the fibres of the brain and the consequent development of abstract symbols into speech and language. The burden of proof in this matter rests with those that deny the analogic probability.

Now going along the multitude of animal forms toward the simplest animal from the most human, where can a line be drawn beyond which consciousness may be disclaimed? With wonderful morphologic variety there is striking biologic uniformity, the same use of the same mechanical principles and of chemical reactions and assuredly of protoplasmic nature generally, so that even in *Amœba*, the simplest, indeed the logical limit of animal structure, we find the same events in type and the same means for producing these events — metabolism in irritable living protoplasm. Even in *Amœba* there is that same amazingly complex protoplasm whose chemiphysical interactions science is only beginning to unravel. Co-ordination in *Amœba* is poor and we find him sometimes trying to crawl in opposite directions for a brief space, for there is of course no nervous matter. For the same reason the animal's adjustment to external conditions is imperfect, although in the main protective of its life.

Notwithstanding all this, the whole varied metabolism is there, giving rise to the same sort of heat, motion and probably electricity, from the same protoplasmic life, supplied by the same nutrients and giving off the same katabolic waste as does a nerve cell or any other cell of a human body. Without a single nerve-fibril the naked protoplasm conducts impulses, as one may quickly see when the whole animal nearly at once contracts after stimulation, and co-ordination and even adjustments occur without anything which can be called nerve. Without muscle contraction takes place. Without separate gland-tissue secretion goes on. Without reproductive cells the marvelous so-called simple division of the animal occurs whenever its overgrowth demands, a process compared with which even mitosis is easy to understand. In *Amœba* then, the logical limit of animal simplicity, a minute drop of uncolored streaming protoplasm, the matter is organized as forces which interact and are mutually and self sustaining. The adjustment of relations which is its life is nearly as perfect as in other animals and because the chemiphysical process at the basis of this series of adjustments is perhaps even more complex than elsewhere (since every function nearly inheres in every part), a modicum, a trace, a sample of consciousness must be supposed to be concerned.

What can be supposed as to the nature of

this requisite consciousness of *Amœba?* Shall we imagine it like our own? Of course not. Can we imagine it at all? Scarcely so, it must be allowed, and yet, "the dim crawling life" is part and parcel of a system of uniformities in which we ourselves and our own consciousness partake and within these limits we can imagine much. It is customary for descriptive psychology to say that the most prominent aspects of mind as we know it are feeling, will and thought. The first, feeling, is based wholly on sensations, on modifications of consciousness which seem to have to do with that protoplasm, which in man and his congeners is made up as sense-organs. *Amœba's* protoplasm and that of other unicells is universally sensitive to irritating stimuli, and its irritation causes reactions exactly comparable to those of protoplasm elsewhere under the influences coming from sense-organs. A dim and simple sensation-mass would seem then to be a reasonable basis and substance of *Amœba's* consciousness. Besides this there are obviously elements of which we know as will or action and this involves that something else, that "certain plusness," not to be defined but representing perhaps in its last analysis the life itself, action, active purposiveness, that quality by which the interactions of *Amœba's* molecules exceed in complexity and in self-adjustment those of other self-regulating materials — if indeed any such besides bioplasm exists. Another word for will is conscious spontaneity and possessing this the animal may still be as much the slave of circumstance as you please for its dependence on its environment is extreme. Sensation-mass and will, conscious spontaneity, such we may imagine, are present in *Amœba's* consciousness. In these nerves are unnecessary, and their physical basis is adequately enough the universally complex, irritable and active protoplasm of which the whole body is composed. So much for this logical type of animal, a speck of undifferentiated bioplasm. In this form we are interested only for these very reasons — that it is the logical type and it is undifferentiated protoplasm only.

In the series of animals from *Amœba* "up" (no scale save a very indistinct one can be made out), we find at once development in the way of a division of labor. Scarcely are we out of the protozoa, the unicellular animals, before certain cells of the various organisms begin to take on distinctly the qualities and uses of nervous tissue, the first token of this being the assumption by certain cells of a new vigor and promptness of reacting to stimulation, it being therefore the sense-organ part of the nervous system which appears first in the phylogenic development. In this simple plan these sensitive cells are also means of defense. In animals a little more complicated we find the rudiments of an entire nervous system, the first form being a mere line or lines of fibrils, with the necessary nerve-cells connecting parts required to work in unison for some reason or other, or where adjustment of any sort is necessary. Functional connection is primarily and always the business of these fibres. In forms of life more and more complicated, the nervous system's reticulum of fibres shows corresponding development, not only in actual intricacy, but in relative mass. Thus in a way the nervous system comes to be a rough general index of the complexity of any animal's life, of relations more and more involved, not only between cells and organs within the limits of the animal, but with numberless conditions outside the individual which are yet part of its environment and in a biologic sense inseparable from itself. Conduction, co-ordination, adjustment, appreciation, become more and more complete as the vital conditions demand. Small portions of the protoplasm develop into sense organs and the corresponding sensation-mass of the animal we may suppose becomes "larger" and richer with inevitably a tinge of feeling in its nature. In very simple forms muscular tissue of a simple sort has already developed, so that actions are made more promptly and in a more perfectly adjusted way. Thus the will has developed also in richness and in strength, as represented by what the various animals variously do.

But if sensation and violation constitute by far the larger part of the brute's consciousness (as of man's) what of cognition, the faculty of knowing, an analytically distinct aspect of the mental continuum? We have scarcely yet escaped the exaggeration which the associationists forced into psychology. Man's pride is reluctant to admit how small is the proportion of cognition and especially of constructive conception in his own mental process minute by minute. If he ordinarily overestimates his own intellectualism in the determination of behavior, it is equally certain that he has somewhat underestimated the practical ideation of the brutes. Researches made of late, especially by Yerkes of Harvard, suggest beyond much doubt that the brutes conduct the rudiments of the processes of ideation (the formation of ideas) and of reasoning (with inference as its essence) much as do humans, but always in far closer connection with actual motor behavior than is the case with ourselves. E. M. Smith of Cambridge University said in 1915: "It is by no means disproved that animals are intelligent and have ideas. . . . The one point that clearly emerges is the need for new methods of inquiry."

It is plain that one of the most pressing needs of animal psychology is definite information in regard to the relative functions of the *senses* in the various genera and orders. G. H. Parker of Harvard, as well as Yerkes and many others, have set about this task more or less systematically, but curiously enough this particular line of work on the more intelligent of "our poor relations" has been mostly neglected. Yet, before we can study intelligently the chimpanzee, the dog, the cat, the pig, we must certainly know just what their senses are like, for sensation is the "beginning" of the reflex nerve-circuits on which all their behavior depends to a greater or less extent. Here is where new methods (often necessarily of great ingenuity), will yield most productive observations. So far most animal psychologists have begun to study the wrong end, so to say, of the reflex "arc," the actual resulting behavior instead of the sensations and the feelings. School children need, above all things else, sense-training and for a like reason psychologists need precise facts as to the perceptual powers of the brute animals. On these data the work of proving that mind is everywhere alike with for the most part only quantitative differences

will perhaps be gratifyingly accelerated. This at least seems to me the present psychologic indication.

GEORGE VAN NESS DEARBORN,
Professor of Physiology, Tufts College.

ANIMALS, Superstitions in Regard to. See AMERICAN MYTHOLOGY.

ANIME, ä-nę-mą, a resin supposed to be obtained from the trunk of an American tree (*Hymenæa courbaril*). It is of a transparent amber color, has a light, agreeable smell, and is soluble in alcohol. It strongly resembles copal, and, like it, is used in making varnishes. Specific gravity is 1.028 to 1.054.

ANIMIKEAN, a term used largely by Canadian geologists for what the United States Geological Survey calls Upper Huronian. See HURONIAN SERIES.

ANIMISM, the system of philosophy propounded by Stahl, and based on the idea that the soul (*anima*) is the seat of life. In modern usage a term applied to express the general doctrine of souls and other spiritual beings, and especially to the tendency, common among savage races, to explain all the phenomena in nature not due to obvious natural causes by attributing them to spiritual agency. Among the beliefs most characteristic of animism is that of a human apparitional soul, bearing the form and appearance of the body, and living after death a sort of semi-human life.

ANIMUCCIA, ä'nē moot'chą, **Giovanni,** Italian musician: b. 1500; d. 1571. He was appointed chapel master of the Vatican in 1555, and composed the 'Laude,' to be sung at the conclusion of the regular office, and from which the oratorio is said to have developed. Hence he is often called the "Father of the Oratorio." He composed a number of masses, motets, madrigals, etc. His most noteworthy works are 'Il primo libro di madrigali, etc.' (Rome 1595); 'Joannis Animucciæ Magistri Capellæ Sacrosanctæ Basilicæ Vaticanæ Missarum Libri' (ib. 1567); 'Magnificat ad Omnes Modos' (ib. 1568) 'Il secondo libro delle laudi ove si contengono motetti' (ib. 1570).

ANIO, ä'nę-ō, **ANIENE,** or **TEVERONE,** an Italian river tributary to the Tiber, which it enters from the east a short distance above Rome.

ANISE, ä'nēz, an annual plant of the family Umbelliferæ. It is a native of Egypt and the Mediterranean regions. The stem is about two feet in height, and divides into several slender branches. The leaves are wedge-shaped. It is extensively cultivated in southern Europe, Germany, India, etc. It is used as a condiment in the preparation of liqueurs, and as a stomachic stimulant in medicine, to relieve flatulence, etc., especially in infants. It contains a volatile oil, called oil of anise, which is used for purposes similar to the seed. The oil is procured either from the seed or from the stems and leaves.

ANISOPHYLLY, ä'nez-ō-fĭ'lĭ, the phenomenon of the production of two sorts of leaves on the same shoot. It is due to the unequal action of several factors, principally gravity and light. For illustrations of this phenomenon in various species consult Boshart, K., 'Beiträge zur Kenntniss der Blattasymmetrie und Exotrophie' (1911); and Figdor, W., 'Die Erscheinung der Anisophillie' (1909).

ANKERITE, a carbonate belonging to the calcite group of minerals. It is intermediate between calcite, magnesite and siderite, the normal mineral being a carbonate of calcium, magnesium and iron, having the formula $2CaCO_3.MgCO_3.FeCO_3$. It occurs in rhombohedral crystals which have perfect rhombohedral cleavage, a hardness of 3.5 to 4, specific gravity of about 3, vitreous to pearly lustre, and usually white color. It also occurs in granular, crystalline and compact masses.

ANKYLOSIS, ăn'ki-lō'sĭs, a stiffening of the joints, a term used by surgeons to denote fixation of a joint not dependent on rigidity of the muscles. It is caused by injury or disease, resulting in a deposit of new bone between the articular surfaces or in the formation of fibrous adhesions. In the latter case the stiff joint may be forcibly bent and the bond of union ruptured, so as to restore mobility. Passive motion, massage, friction are the usual modes of treatment. Sometimes, however, an anæsthetic is administered and the joints are moved by force. See JOINT, DISEASES OF.

ANN ARBOR, Mich., city and county-seat of Washtenaw County, on the Huron River, and the Michigan Central, the Ann Arbor and Toledo railroads and the Detroit United Railway. It is situated among the picturesque hills of southern Michigan, 38 miles from Detroit, and is regarded as one of the most desirable residential cities in the Middle West. Here is the seat of a famous school of learning, the University of Michigan (see MICHIGAN, UNIVERSITY OF). Ann Arbor has, among prominent buildings, an auditorium with seating capacity of 5,000; a university hospital, a homœopathic and four other hospitals, county courthouse, post-office building, high school and numerous churches and public and private schools, two schools of music, two libraries. It is the business centre of a large agricultural and fruit-growing region and an important shipping point. It has extensive manufactures of agricultural implements, furniture, pumps, engines, automobile accessories, laces and curtains, steel ballbearings, boilers, lumber products, organs, pianos, flour, wagons, etc. The United States census of 1914 reported 75 manufacturing establishments of factory grade, employing 1,079 persons, of whom 842 were wage earners, receiving a total of $516,000 annually. The capital employed was $2,888,000, and the value of the year's output was $2,603,000; of this, $1,301,000 was added by manufacture. The Barton Dam furnishes water power, producing electric energy sufficient for the city and surrounding territory. The city has an extensive electric light system, waterworks plant and electric traction lines connecting with Jackson, Kalamazoo, Battle Creek, Detroit and other cities. The waterworks are owned by the city. It has daily and weekly newspapers and one national bank, three savings banks and two branch banks. It was originally settled in 1824 and was incorporated as a city in 1851. Pop. (1890) 9,431; (1900) 14,509; (1910) 14,817; (1914) 14,500, besides 7,000 students.

ANNA, Ill., city in Union County, 35 miles northwest of Cairo, on the Illinois Central Railroad. It contains a public library and the State Hospital for the Insane. It has a large trade in the agricultural products of the district, which produces corn, fruit, hay, vegetables and wheat. Pop. 2,809.

ANNA IVANOVNA, ān'na ē-vä'nôv-na, Empress of Russia: b. 1693; d. 28 Oct. 1740. She was the second daughter of Ivan, brother of Peter the Great. In 1710 she was married to the Duke of Courland, who died the following year, the last of his line. On the death of Peter II in 1730 the Supreme Council offered her the throne, under certain conditions restricting the power of the monarchy. Ostermann, her former preceptor, and in 1730 Chancellor of the Empire, furthered her cause before the Council, but was later chagrined at finding her less amenable to his wishes than he had hoped. During the earlier portion of her reign Russia was engaged in the War of the Polish Succession and also in war with Turkey in the Crimea in 1736–39. At home her administration under the influence of Biron was a very cruel one. Thousands were exiled to Siberia and other thousands were tortured at home. Among the victims were Prince Basil Dolgoruki and members of his family. The Empress's health broke down in 1740, and she died in the autumn of that year, leaving the throne to her grandnephew Ivan, under the regency of Biron. See RUSSIA.

ANNA KARÈNINA. The world has come to regard Tolstoï's novel, 'Anna Karènina' as one of its greatest masterpieces; but the author himself, who in the character of Levin depicted his own vain efforts to discover the secret of happiness, began to detest it before it was half finished. He called it "ordinary and empty," "incoherent, neither fish-nor-flesh stuff"; he even wanted to destroy, certainly to disown it. He slightingly characterized it as "a novel, showing how an officer fell in love with a married woman." The immediate incentive to its composition was his chancing on the commencement of a story by Pushkin. He cried out: "That is the way to begin a book," and on 19 March 1872 began 'Anna Karènina' with the sentence, "All happy families resemble one another; every unhappy family is unhappy in its own way." Its publication in the *Russky Vyestnik* (*Russian Messenger*), edited by Katkof, immediately aroused the greatest enthusiasm in Russia. Tolstoï was amazed at its popularity, but soon lost interest in it and allowed months to elapse without furnishing the expected copy or even correcting the proofs. When the Turco-Russian War broke out in 1876, he brought it to a conclusion with a chapter showing his disapproval of the volunteer movement. Katkof refused to publish it, returned the manuscript, and printed a brief note to the effect that the logical end of the novel was the death of Anna. The extra section was included in the definitive edition in three volumes aggregating 1,381 pages. The novel is panoramic: it gives a multitude of episodes of high life in Moscow and Saint Petersburg and of country life in the district of Korazinsky. Its main purpose is to contrast the rather frivolous existence of a public official mingling in corrupt social circles with the serious endeavors of an idealistic landowner bent on carrying out reforms among the peasantry. It also contrasts the homely "family happiness" of the conventionally married couple with the irregular relationship of a married woman and a wealthy count, logically ending in despair and death. It is really two stories in one. The unhappy love-affairs of Prince Stepan Oblonsky and of his sister Anna bring into relief the pure and delicate romance of the Princess Oblonskaya's youngest sister, the Princess Kitty Shcherbátskaya with Konstantin Levin, a landed proprietor, a bashful, erratic idealist, uncertain of himself, making all kinds of experiments, dissatisfied, but high-minded. In Levin Tolstoï undoubtedly depicted his own nature and it gave him an opportunity to introduce his own observations on philosophy, agronomy and religion. The account of Levin's proposal was taken directly from Tolstoï's wooing of Miss Sophia Beers. Indeed the author frequently drew his details from his own experiences and his characterizations from his keen study of his relatives and friends. He painted from real life the gambling scenes, the horse-racing, the death of Levin's disreputable brother, the hunting episodes, the quaint and often amusing naïvetés of the peasantry. The tragic suicide of Anna Karènina was probably the echo of a tragedy which took place on the railway near Tolstoï's country estate, Yasnaya Polyana. 'Anna Karènina' is often careless in style and contains strange incongruities, but taken all in all it seems like a veridical history rather than fiction. It belongs to world-literature. The first English translation, somewhat expurgated, was made by Nathan Haskell Dole in 1886, but revised and rendered complete in 1899. There are also translations by Leo Wiener, Mrs. Constance Garnett and Aylmer and Louise Maude.

NATHAN HASKELL DOLE.

ANNA KARLOVNA, ānna kär'lov-na, Regent of Russia during the minority of her son Ivan: b. 1718; d. 1746. She was the daughter of Charles Leopold, Duke of Mecklenburg, and of Catharine, sister of the Empress Anna Ivanovna. She married Anthony Ulric, Duke of Brunswick-Wolfenbüttel in 1739. A son Ivan was born to them 24 Aug. 1740, and was appointed her successor by the Empress Anna Ivanovna. The latter died in October 1740, and Biron, whom she had appointed regent, was soon overthrown. Anna Karlovna thereupon proclaimed herself Grand Duchess and Regent of Russia, but she showed little capacity for administration and soon fell under the influence of Julia Mengden, one of the ladies of her court. A conspiracy to place Elizabeth, daughter of Peter the Great, on the throne was successful and Elizabeth was proclaimed Empress 6 Dec. 1741. Ivan was soon afterward murdered at the castle of Schlüsselburg; Anna and her husband were condemned to prison for life and confined at Kholmogory on the White Sea, where she died in 1746. Her husband survived her 34 years, and died in prison in 1780.

ANNA LEOPOLDOVNA. See ANNA KARLOVNA.

ANNALS OF A SPORTSMAN, a work by Ivan Turgeneff, consists of 22 short sketches of Russian peasant life, appearing in book form

in 1852 and establishing the author's reputation as a writer of realistic fiction. Turgeneff represents himself as on a hunting trip through the country districts, noting the local life and social conditions, and giving truthful studies of the state of the serfs before their liberation by Alexander II; his book being one of the agencies that brought about that reform.

ANNAM, ăn'năm'. See ANAM.

ANNAMABOE, ä'nä-mä-bō', Africa, seaport town, with a fort, on the Gold Coast, 10 miles east of Cape Coast Castle. It was at one time a principal mart for slaves, in trafficking in which many of its inhabitants became wealthy, and is still a place of considerable trade. Pop. about 5,000.

ANNAN, Scottish seaport and parliamentary borough in Dumfriesshire, on the Annan River. It has railroad connection with Glasgow, Carlisle and Edinburgh, and water connection with Liverpool and Whitehaven. The important manufactures are tanning, ropeweaving and cotton-spinning.

ANNAN, a river of Scotland, having a course of about 50 miles, flowing from north to south through the centre of Dumfriesshire to the Solway Firth, its sources being not far from those of the Tweed and Clyde.

ANNAPOLIS, Md., the capital and port of entry of Maryland and county-seat of Anne Arundel County; on the Severn River, two miles from Chesapeake Bay, on the Maryland and the Annapolis, Baltimore and Washington electric railroads. It is 26 miles southeast of Baltimore and 30 miles northeast of Washington, D. C. It is also connected by boat with Baltimore and other cities on the bay. It is in a fruit and berry-growing region; has oyster-packing plants, marine railway, glass factory, two banks, daily, weekly and other periodicals, and a property valuation of $3,000,000. Annapolis is widely known as the seat of the United States Naval Academy (q.v.), with its beautiful new buildings and grounds on which the government has expended $15,000,000. The marine barracks and naval experiment stations are also situated here. Saint John's College, the first free school in America, was established in Annapolis in 1696; there are good schools, a fine new high school and a preparatory school for the naval academy. The State buildings include the Colonial State House dating from 1772, recently rebuilt, and the little treasury building. There are Catholic and Presbyterian churches and the historic Episcopal Church of Saint Anne first erected in 1695. A convent, a house of Redemptorist Fathers, formerly the Carroll residence, and some of the finest colonial mansions in the country are among other points of interest, as well as the bronze statues of Gen. John de Kalb and Chief Justice Roger B. Taney. The city was founded in 1649 and was first named Providence. It received its present name in honor of Queen Anne and was made the capital of the province in 1694; in 1708 it was given a charter by the Queen. Annapolis played an important part in early American history. On 19 Oct. 1774, the brig *Peggy Stuart* laden with tea was burned in the harbor in protest against the taxation of the colonies by Great Britain; the first Federal Constitutional Convention was held here in 1786, and in 1783 Washington surrendered his commission in the senate room of the State House where a year later the treaty of peace with England was signed. Pop. (1910) 8,609; (1914) 8,643. Consult Ridgeley, 'Annals of Annapolis' (Baltimore 1841), and Powell, 'Historic Towns of the Southern States' (New York 1900).

ANNAPOLIS CONVENTION. This small gathering was held 11 Sept. 1786, to discuss proposed changes in the Articles of Confederation. By the time it met, the Confederation had utterly broken down: Congress could not find means to carry on the government and the Annapolis Convention was anxiously looked to as the last hope by the business interests. Only five States were actually represented,—New York, New Jersey, Pennsylvania, Delaware and Virginia. These, however, were precisely the ones which wished the entire Confederation remodeled. New Jersey had instructed its delegates to accept nothing but a new Federal government; and the New York group, headed by Alexander Hamilton, was equally zealous for a stronger system. John Dickinson, one of the chief authors of the Articles of Confederation, was made chairman; and a committee was appointed to prepare a report, which was drafted by Hamilton, though he was not on the committee. This report recommended that the States they represented should agree, and try to induce the others to agree, "to meet at Philadelphia on the second Monday of the next May, to consider the situation of the United States and devise such further provisions as should appear necessary to render the Constitution of the Federal government adequate to the exigencies of the nation; and to report to Congress such an act as, when agreed to by them and confirmed by the legislatures of every State, should effectually provide for the same." They then adjourned; but this call led to the convention of 1787, where the Constitution was adopted.

ANNAS (Hebrew, "merciful"), a Jewish high priest; appointed high priest by Quirinus, proconsul of Syria, about 7 A.D., and deposed by Valerius Gratus, procurator of Judea, in 14 A.D. His family was wealthy and he was evidently very influential, as the office of high priest was held by five of his sons and his son-in-law, Caiaphas, before 36 A.D. In the New Testament (Luke iii, 2; John xviii, 13; Acts iv, 6) Annas is mentioned as high priest conjointly with Caiaphas. The first hearing of Jesus was before Annas, who sent him bound to Caiaphas.

ANNATES, ăn'nātz, a certain portion of the year's fruits or revenues paid to the Pope and his court. The term properly denotes the sum of half a year's revenue of a vacant benefice (q.v.) payable by the new incumbent to the Pope. It was also used to indicate the tribute every bishop or mitred abbot was obliged to pay for the support of the Pope and cardinals, and the lesser sums they contributed for the support of members of the Papal household. These tributes or taxes were frequently a cause of contention between ecclesiastical and civil authorities. An effort was made to put an end to these contentions in the Councils of Pisa and Constance, and gradually all the minor tributes were abolished. In the Council of Basel it was decided to abolish every tribute of this kind, but to raise revenues for the anti-

pope Felix exactions doubly severe were imposed on his adherents. In Germany the payment was satisfactorily regulated in the Concordat of Vienna (1448) and after several modifications it was finally abolished in 1803. In France the payment was stipulated in a Concordat between Innocent X and Francis I; it was finally refused entirely in 1789, and its abolition recognized in the Concordat of 1801. In England such sums were first paid to the archbishop of Canterbury, later to the Pope, and transferred to the Crown in 1534, the sovereign at present retaining only those derived from bishoprics and Crown livings, the rest, since Queen Anne's time (see QUEEN ANNE'S BOUNTY), going to increase the poorer livings. The Pope used them to support himself, the cardinals and other papal officials; to defray the expenses of nuncios, legates, bishops exiled from their sees, princes deprived of their thrones, envoys and vicars apostolic to missionary countries. As this source of revenue has been constantly falling off during the past century, the deficit is made up by the voluntary contributions of Catholics, known as "Peter's Pence" (q.v.). Consult Ferraris, 'Prompta Bibliotheca.' See FIRST FRUITS.

ANNATTO, ăn-năt'tō, **ANATTO**, or **ARNOTTO**, a small tree which grows in Central and South America. The seeds are surrounded with a thin coating of waxy pulp, which is separated from them by washing in water, passing the liquid through a sieve and allowing the suspended pulp to deposit. The water is then drained away and the paste dried, till it is a thick, stiff, unctuous mass. In this state it has a dark orange-red color and is known as "roll" or "flag" arnotto, according to the form in which it is put up, but when further dried it is called "cake" arnotto. It is much used by South American Indians for painting their bodies; among civilized communities its principal use is for coloring butter, cheese and varnishes. It yields a fugitive bright orange color, and is to some extent used alone, or in conjunction with other dyes, in the dyeing of silks and in calico printing.

ANNE, ăn, Queen of Great Britain and Ireland: b. at Twickenham, near London, 6 Feb. 1664; d. 20 July 1714. She was the second daughter of James II, then Duke of York, and Anne, his wife, daughter of the Earl of Clarendon, and was educated according to the principles of the English Church. In 1683 she was married to Prince George, brother to King Christian V of Denmark. On the arrival of the Prince of Orange in 1688 Anne desired to remain with her father; but was prevailed upon by Lord Churchill, afterward Duke of Marlborough, and his wife, to join the triumphant party. After the death of William III in 1702 she ascended the English throne. Her character was amiable but lacking in firmness, and she was influenced first by Marlborough and his wife and afterward by her favorite, Mrs. Masham. Most of the principal events of her reign are connected with the war of the Spanish Succession. The only important acquisition that England made by it was Gibraltar, captured in 1704. Another very important event of this reign was the union of England and Scotland, under the name of Great Britain, which was accomplished in 1707. She seems to have long cherished a wish to secure the succession to her brother James, but this was frustrated by the internal dissensions of the Cabinet. Grieved at the disappointment of her secret wishes, she fell into a state of weakness and lethargy and died. The reign of Anne was distinguished by the brilliant successes of the British arms. Consult Oldmixon, 'Life of Queen Anne' (1716); Ashton, 'Social Life in the Reign of Queen Anne' (1882).

ANNE, Saint, wife of Joachim and mother of the Virgin Mary. The Catholic Church celebrates her feast day on 26 July.

ANNE, Sister, the sister of Fatima in the tale of 'Bluebeard.' From the top of the castle tower she awaits the arrival of their brothers to rescue them.

ANNEALING, a process to which metals and glass are subjected in order to increase their ductility, or lessen their liability to fracture under sudden stress. It is usually effected by heating the substance to be annealed until it approaches softness, and then allowing it to cool very slowly. Copper, however, is best annealed by heating it to a high temperature and then plunging it immediately into water. Metals that are to be annealed should be heated in close vessels, so that they may not be affected by direct contact with the fuel. It is not uncommon to anneal large masses of metal or glass by allowing the fires in the heating furnace to go out, and permitting the furnace and its contents to cool together. The articles to be annealed are also often buried, while still hot, in lime, ashes or some other poor conductor of heat and left until cold. Metals that are to be drawn into wire or rolled into sheets, or pressed into complicated shapes, usually require annealing during the process, as otherwise they are likely to become brittle and crack or break. Zinc, however, grows strong and flexible as it is drawn into wire, though it loses its flexibility and regains its crystalline structure if kept in boiling water for a time. It is usually taught that the object of annealing is to soften the material sufficiently to allow molecules to move slightly among themselves, and thus relieve the strains previously introduced by sudden cooling, or by the violent stresses to which the material has been subjected in the process of working. This theory is very possibly true to a certain extent, but the anomalous cases of copper and zinc, cited above, show that it can be regarded only as a first approximation to the ideal theory of annealing, which has yet to be discovered. See TEMPERING.

ANNECY, ăn'sē, town of eastern France, situated in the central part of the department of Haute Savoie at the northwest end of Lake Annecy. It has manufactures of silk, cotton, wool and steel, and contains many buildings of historical interest, including a cathedral and the old castle of the counts of Genevois. Pop. about 15,000.

ANNENSKI, Nikolai Feodarovich, ă-nĕn'skē, Russian publicist and social worker: b. 1843. He spent his childhood in Siberia, where his father was engaged in military service. He took the degree of bachelor of law at the University of Saint Petersburg in 1867 and the bachelor's degree in history and philology in 1873. In 1867 he entered the civil service, tak-

ing first a position in the office of the state comptroller and later (1873) in the statistical department of the Ministry of Ways and Means. At the same time he was active as a writer. He contributed articles, mainly on finance and economics, to *Otechestrennuiya Zapiski, Dielo, Zhurnal* of the Ministry of Ways and Means, and the newspaper *Russkaya Pravda*. His articles in the *Dielo* entitled 'Sketches of the New Direction in the Science of Economy' particularly attracted attention. His literary activities were interrupted by his arrest for participation in the Nechayev affair. He was released in two months and rearrested twice, in 1879 and 1880. His second arrest was followed by exile to western Siberia for "political offenses." In 1881 he was transferred to Sviyazhk, government of Kazan. Freed from police supervision, he settled first in Kazan (1881) and later (1883) in Nizhni-Novgorod, holding in both cities the position of head statistician of the Zemstvo. At that time he contributed to *Volshki Vyestnik, Russkoye Slovo* and other journals. In 1895 he returned to Saint Petersburg, where he became head statistician of the Municipal Court. He was then also connected with the editorial department of *Russkoye Bogatstvo* and since 1904 has been its director-in-chief. He also wrote for the Free Economical Society. He was interested in politics and directed protests against the oppressions of the government. He was exiled from Saint Petersburg in 1901 and again in 1904. In the autumn of the same year he returned to Saint Petersburg and continued his political activities as a director of the Emancipation League. In 1905 he was again arrested as one of the deputies of the Writers' League of Saint Petersburg sent to Minister Witte with the request to avert an expected bloodshed. In 1906 he became one of the founders of the People's Socialistic party (Narodno-Sotzialisticheskaya Partiya).

ANNESLEY, Samuel, English Non-conformist clergyman: b. near Warwick in 1620; d. in 1686. He was educated at Oxford. He served for a time as chaplain at sea and later as parish priest of two different London congregations. He refused to conform to the "Act of Uniformity" and suffered severe persecutions. He became a leader of the Puritans and preached almost daily. De Foe knew him well and wrote an elegy on him. It is said that "the Non-conformists considered him a second Saint Paul." He was the father of 27 children. Susannah, his 25th child, became the wife of Samuel Wesley and was the mother of 19 children, among whom were John Wesley, the founder of Methodism, and Charles, the hymn writer.

ANNESLEY, 6TH EARL OF (Francis), son of the 5th earl: b. 1884. He succeeded to the title in 1908. He had taken up aviation some years before the outbreak of the European War, and had gone through some exciting aerial adventures during the Balkan Wars of 1912–13 on the side of the Balkan allies. He subsequently joined the Royal Naval Volunteer Reserve as sub-lieutenant. He had spent a few days at home on furlough from the western front, and on 5 Nov. 1914 started from Eastchurch in an aeroplane piloted by Flight Lieut. Charles F. Beevor, R.N., *en route* for France. They were shot down by the Germans while flying over Ostend, and both were instantly killed.

ANNEXATION, politically, the formal incorporation by a state with itself of territory previously under another government; usually territory contiguous to itself or its colonial possessions, or an insular neighbor, but only because other annexations are rarely desired, not from any principle of international law. The annexation may be by purchase, peaceful cession or conquest. Existing laws and local authorities do not lose their binding force and title to obedience till the formal act of annexation is passed by the new power, or treaty or proclamation validates it, even after cession by the old; though that cession cancels all legal relation to the former sovereign power.

Annexations to the United States.—(1) The Louisiana Purchase (q.v.) from Napoleon, 1803; 1,171,931 square miles, including Alabama and Mississippi south of lat. 31° S.; the whole of Louisiana, Arkansas, Missouri, Iowa, Nebraska, North and South Dakota, Idaho, Montana, Oregon, Washington and Indian Territory; Colorado and Wyoming east of the Rocky Mountains; Kansas, except the southwest portion south of the Arkansas River, and Minnesota west of the Mississippi. This was bought by Jefferson's administration for $15,000,000, $3,750,000 of it in assumption of claims of American citizens against France. The preliminary convention was signed by Livingston and Monroe 30 April 1803, and was confirmed by the Senate in special session 19 Oct. 1803, and by the House the 25th,—the extreme Federalists opposing it as unconstitutional, and the President acknowledging it to be so, but necessary.

(2) Florida (q.v.), 1819–21, from Spain: 59,268 square miles; price $5,000,000, entirely in assumption by the United States of claims of its citizens against Spain, and the relinquishment by it of claim to Texas and the boundary of the Rio Grande. The treaty was signed by the Spanish Minister at Washington, 22 Feb. 1819; Spain refused to ratify it till after two years of vain insistence that the United States should refuse to recognize the independence of the South American States.

(3) Texas (q.v.), 1845: 376,133 square miles. Texas, originally part of the Mexican province of Coahuila, obtained its *de facto* independence in the War of 1836 against Mexico, was acknowledged by the other powers in 1837, and at once began the attempts for admission into the United States which had been the ultimate object of its first colonization by Southern settlers. In the previous April a treaty of annexation with Texas had been concluded, but was rejected by the Senate. President Tyler on the last day of his term sent a special messenger to secure the consent of the Texas Congress to annexation; it acceded unanimously, a popular convention of 4 July ratified the action, and the annexation was completed by a joint resolution of the United States House 16 Dec. 1845, and of the Senate on the 22d. It claimed west to the Rio Grande, taking in all the immemorially Spanish province of Coahuila, a circumstance which led to the Mexican War.

(4) New Mexico and Upper California, seized from Mexico in the War of 1847, and annexed by the treaty of Guadalupe-Hidalgo, 2 Feb. 1848: 545,783 square miles. Besides the

present State of California it included. Utah and Nevada, the most of Arizona and New Mexico and Colorado west of the Rocky Mountains. Price, $15,000,000, and the assumption by the United States of $3,250,000 in claims of its citizens against Mexico. The portion of New Mexico east of the Rio Grande was claimed by Texas, which afterward received $10,000,000 from the United States in release.

(5) The Gadsden Purchase (q.v.), 1853, from Mexico: southern Arizona and New Mexico from the Gila Valley to Chihuahua (the Mesilla Valley), 45,535 square miles; price $10,000,000.

(6) Alaska (q.v.), 1867; 590,884 square miles; price, $7,200,000. Bought by the United States from Russia by treaty of 30 March, ratified by the Senate in special session 20 June.

(7) Hawaii, 6 July 1898; 6,740 square miles; price, a compensation to the Queen, Liliuokalani, recently adjusted at $200,000. Annexed by a joint resolution of Congress.

(8) Porto Rico, the Philippine Islands and Guam of the Ladrone Islands, 1898; taken from Spain as the result of war; ceded by Treaty of Paris, 10 Dec. 1898; about 150,000 square miles; price, $20,000,000, plus $100,000 subsequently paid for two small islands omitted from the treaty.

(9) Tutuila, with the smaller islets of Tau, Onesinga and Ofu, of the Samoan group, 1899; 54 square miles, including the harbor of Pago-Pago; obtained by tripartite treaty with Great Britain and Germany.

(10) A number of small scattered islands in the Pacific, taken at different recent times, including Wake, January 1899. See UNITED STATES — TERRITORIAL EXPANSION.

ANNIE KILBURN, a novel of New England life, by W. D. Howells, published in 1888. It is a character study of a woman in her later youth who returns to her native town after a long sojourn in Rome, unfitted by her life abroad for sympathy with her girlhood friends, yet with no diminution in the strength of her Puritan conscience.

ANNIHILATION is the name of a doctrine held at different periods in the history of the Church. It means the exaltation of the righteous and the annihilation of the wicked. Brahmanism holds a periodic annihilation. It is said that the Siamese hold annihilation as the crowning reward of virtue. There are some traces of a belief in the theory in the writings of the early Church fathers. Jonathan Edwards had a long controversy with Dr. Chauncey on the subject. Later Archbishop Whately held the same view regarding the wicked. From 1850 to 1860 the question was much discussed. It is now a dead question in theological circles.

ANNISTON, ăn'nĭs-tŏn, Ala., city, capital of Calhoun County; on the Louisville & N. and Southern railroads, 62 miles northeast of Birmingham. It is in one of the most important coal- and iron-mining regions of the country; is a trade centre for cotton and agricultural products; and is noted for its manufactures of iron and steel, cast-iron piping, cotton goods, bricks, cordage and other articles. The United States census of 1914 reported 40 manufacturing establishments of factory grade, employing 2,491 persons, of whom 2,327 were wage earners, receiving annually $1,023,000 in wages. The capital engaged aggregated $3,810,000, and the year's output was valued at $4,365,000: of this, $1,819,000 was added by manufacture. Anniston is the seat of the Southern Female College, the Noble Female Institute and the Alabama Presbyterian College for young men; has three national banks, numerous fine churches and other public buildings. It was founded by the Woodstock Iron Company in 1872 and received a city charter in 1879. Pop (1910) 12,794; (1916) 15,000.

ANNONACEÆ, ăn-ō-nā'çe-ē, the custard-apple family, a group of trees and shrubs with simple, alternate leaves, destitute of stipules, by which character they are distinguished from the *Magnoliaceæ,* to which they are otherwise closely allied. Their flowers are commonly axillary, sometimes terminal. The calyx is persistent, with three deep divisions. The corolla is formed of six petals, disposed in two series. The stamens are very numerous, forming several series; their filament short, their anthers almost sessile. The carpels, generally aggregated in great numbers in the centre of the flower, are sometimes distinct, sometimes connected; each of them has a single cell which contains one or more ovules attached to the inner suture, and often forming as many distinct fruits (rarely one only in consequence of abortion); sometimes they are united together and form a kind of fleshy, scaly cone. The seeds have a horny endosperm deeply grooved, and this is another character which distinguishes them from the *Magnoliaceæ.* The *Annonaceæ* are mostly tropical plants belonging both to the Old and New Worlds, the pawpaw (*Asimina triloba*) being the best-known American species. They are generally aromatic, a quality found chiefly in the bark, but also in the leaves and flowers, and to some extent in the fruit, all of which parts are consequently employed in the countries of which the plants are native as remedies and for seasoning. Many of them yield likewise an edible and nutritious fruit, extremely agreeable to the taste.

ANNUAL, in botany, a plant which germinates, grows and produces its seed in a single growing season, after which it dies. Plants which are annuals in temperate regions may, in tropical countries, live for several years. Winter annuals are plants which germinate in autumn, persist through the winter, then flower, produce seed and die.

ANNUALS, in literature, the name given to a class of publications enjoying at one time an immense yearly circulation, and distinguished by great magnificence both in binding and illustration, which render them much sought after as Christmas and New Year presents. Their contents were chiefly prose tales and ballads, lyrics and other verse. The earliest was the 'Forget-me-not,' started in 1822, and followed next year by the 'Friendship's Offering.' The 'Literary Souvenir' was begun in 1824 and the 'Keepsake' in 1827. Among the names of the editors occur those of Alaric A. Watts, Mrs. S. C. Hall, Harrison Ainsworth, Lady Blessington and Mary Howitt. The popularity of the annuals reached its zenith about 1829, when no less than 17 made their appearance; in 1856 the 'Keepsake,' the last of the series, ceased to exist.

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